THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LV. No. 1401.] LONDON, MARCH 18, 1890. [42ND YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.
Guaranteed Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
The Original "Torbay Paints"
As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.
Illustrated Price List Post Free.
TORBAY & DART PAINT Co., Ld.,
23, Gt. George St., Westminster, S.W.
DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.
Ashmore, Benson, Pease, & Co., Ld.,
STOCKTON-ON-TEES,
Manufacturing Gas Engineers.
See Advertisement, p. 473.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.
Office: 7, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.
ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

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"ABYSSINIAN" & ARTESIAN TUBE WELLS,
FOR TOWN WATER-WORKS AND OTHER SUPPLIES.
The following Town Water-Works Supplies have been obtained by this System, viz. :—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.
LE GRAND & SUTCLIFF,
HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

FUEL ECONOMY.
MELDRUM'S PATENT FURNACES
RAISE STEAM BY BURNING
BREEZE, COAL DUST,
AND OTHER SMALL AND POOR FUEL.
Telegrams: "Meldrum Manchester."
REALIZED SAVING UP TO
Results Guaranteed.
£200
PER BOILER PER ANNUM.
MELDRUM BROTHERS,
26, HALF STREET, CATHEDRAL YARD, MANCHESTER.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

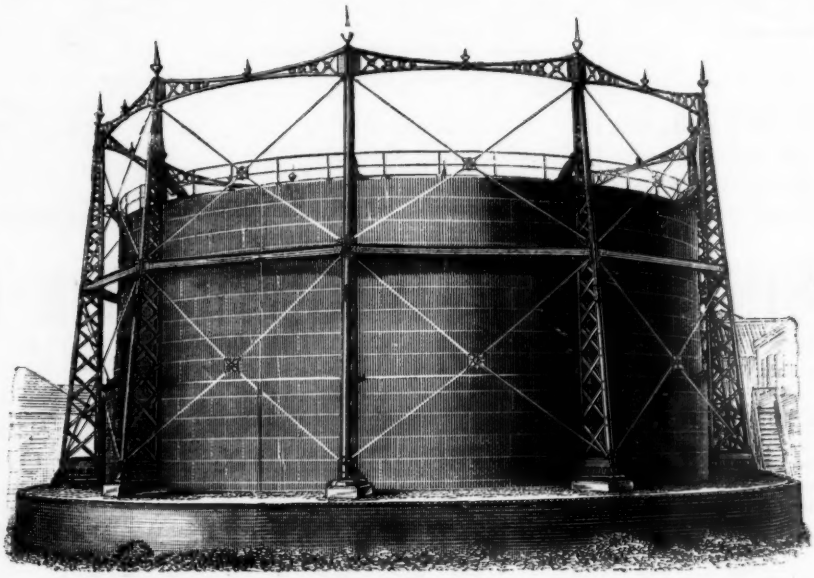
TELEGRAPHIC ADDRESS: "COCKEY'S FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers, Ironfounders, & Contractors,

Manufacturers of *GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS.*



Manufacturers of *PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, Weighbridges, COKE BREAKERS.*

SOLE MAKERS OF COCKEY AND SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

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MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

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GAS APPARATUS
OF EVERY DESCRIPTION
INCLUDING
GASHOLDERS
and Tanks,
Retorts, Purifiers,
Valves, Scrubbers,
Condensers,
ETC., ETC.

All of the most approved Designs.

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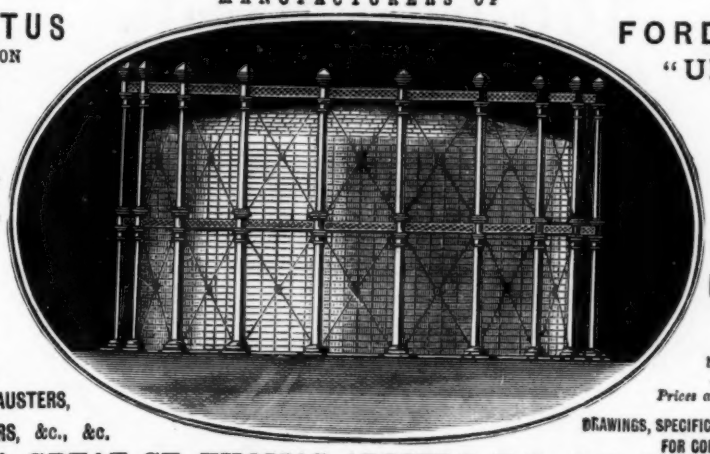
METERS, GAUGES, GOVERNORS, &c., &c.



FORD'S PATENT
"UNIVERSAL"
SCRUBBER-
WASHER.
Numbers at work, giving excellent results.
No Motive Power Required.

ALSO OF
SOMERVILLE'S PATENT
RETORT MOUTHPIECES
AND
SELF-SEALING LIDS.
NO LUTING REQUIRED.

Prices and Particulars on application.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES PREPARED FOR COMPLETE GAS PLANT.

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MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

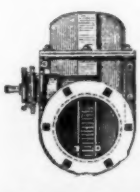
MANUFACTURERS OF

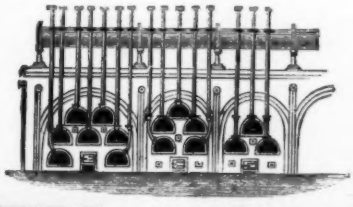
SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.
GASHOLDERS,
AND
Gasholder Tanks.

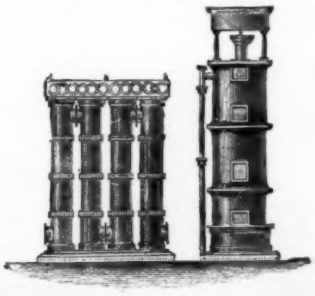
CAST-IRON RETORTS,
RETORT-BED FITTINGS,
And Retort-House Appliances
of every description.
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON
CONDENSERS,
SCRUBBERS, & WASHERS,
TAR AND LIQUOR PUMPS, &c.

PATENT
CENTRE VALVES
for working Purifiers.
Also Bye-Pass & Stop Valves







PURIFIERS with Planed Joints,
HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.
WOOD GRIDS.
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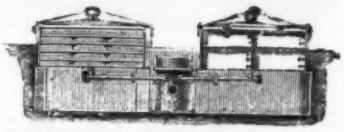


DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

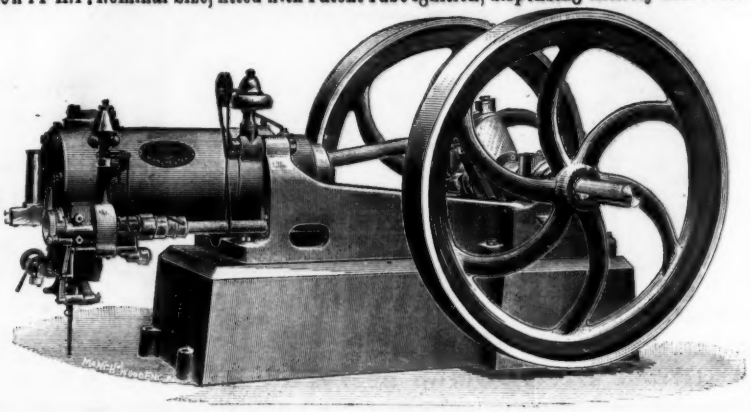
MADE in SIZES
2-Man to 100-HP.

GAS-ENGINES
COMBINED
WITH
PUMPS
FOR
TOWNS SUPPLY,
SEWAGE, &c., &c.

GAS-ENGINES
COMBINED
WITH
AIR COMPRESSORS
FOR THE
SHONE SEWAGE
SYSTEM, LUCIGEN
LIGHT, &c.

100 Prize Medals.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES
2-Man to 100-HP.

VERTICAL
AND
HORIZONTAL
TYPES.

ENGINES
COMBINED
WITH
HOISTS, PUMPS,
DYNAMOS, &c. &c.

Largely used for
EXHAUSTING,
PUMPING,
COKE CRUSHING,
ELECTRIC LIGHTING,
&c., &c.

Over 31,000 "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON,
LIVERPOOL,
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NEWCASTLE,
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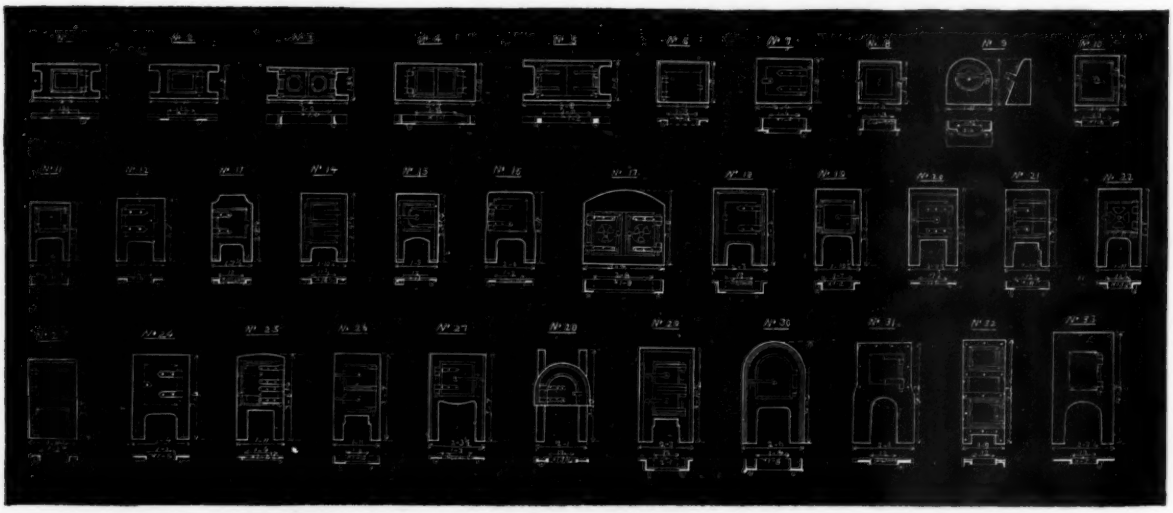
HARRIS & PEARSON,
STOURBRIDGE, ENGLAND.
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.

R. & J. DEMPSTER,
Engineers, Ironfounders, and Contractors,
GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.



RETORT MOUNTINGS.

Furnace Doors and Frames suitable for Generator, Regenerator, and ordinary Retort Furnaces.

MOST OF THE ABOVE DESIGNS CAN BE MADE IN WROUGHT IRON, IF DESIRED.

Patterns for other Designs made to Order.

GREAT SAVING IN COST.

GASHOLDERS WITHOUT GUIDE - FRAMING.

PEASE'S WIRE-ROPE SYSTEM.

EQUALLY APPLICABLE TO NEW AND ENLARGED HOLDERS.

APPLIED WITH PERFECT SUCCESS.

ADOPTED BY THREE COMPANIES.

ASHMORE, BENSON, PEASE, & Co., Ld.,

STOCKTON-ON-TEES.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.
RETORTS CAREFULLY PACKED FOR SHIPMENT.
A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
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MARK.	CLAY CROSS.	53, QUEEN VICTORIA ST., E.C.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms–

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations:–

ILKESTON.	BURY.	CHORLEY.
WIDNES	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

CUTLER'S PATENT
SPIRAL GUIDE-FRAMING
FOR GASHOLDERS.

STRONG. SAFE. CHEAP.

MOST ADVANTAGEOUS DISPOSITION OF MATERIAL.

Economical both in Manufacture and Erection; and by avoiding the necessity for large Piers, permitting considerable Economy in the Construction of the Tank.

FULL PARTICULARS FROM THE PATENTEES,

MESSRS. S. CUTLER & SONS, ENGINEERS,

GREAT GEORGE STREET CHAMBERS,

16, GREAT GEORGE ST., WESTMINSTER, S.W.

WORKS: MILLWALL, LONDON, E.

KIRKHAM, HULETT, & CHANDLER, Ld.,

PALACE CHAMBERS,

9, BRIDGE ST., WESTMINSTER.

Mr. S. HERSEY, Managing-Director. Mr. J. CHANDLER, Engineer.

THE "NEW" PATENT

"Standard" Washer-Scrubber,

As supplied to and in course of construction for numerous Gas-Works. (*See previous Advertisements.*)

Thoroughly extracts every grain of Ammonia and a large quantity of other Impurities from Gas.

Has been for many months in successful and satisfactory operation at **The Gaslight and Coke Company's Station at BECKTON** (*vide* Testimonial).

The Gaslight and Coke Company, Horseferry Road, Westminster, S.W.,
Nov. 25, 1889.

Messrs. Kirkham, Hulett, and Chandler, Ltd.,

Gentlemen,—In reply to your enquiry respecting the result of putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say that they have answered admirably for the few months they have been in; and I think them a decided success.—I am, yours truly,

(Signed) G. C. Trewby.

1. The weight in motion is **only one-seventh** of that in the present Machine.
2. It requires **only one-seventh** the power to drive; consequently effecting a large reduction in cost of Engine as well as in steam power.
3. **The Wear and Tear is enormously reduced,** as the Shaft has comparatively little weight to carry.
4. It has been found that the washing surfaces **keep perfectly clean** and free from deposit from end to end of the Machine.
5. It is so constructed that it forms a most powerful, effective, and complete system of purification, gives no pressure, and can be removed and replaced without trouble or injury.
6. The "New Standard," owing to the foregoing, can be supplied at **a large reduction in price.**

Engineers desirous of working Ammoniacal Liquor over and over again prior to leaving the "New Standard" can do so by the automatic and simple arrangement which forms part of this Patent.

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

THE "STANDARD" TAR, H_2S, & CO_2, EXTRACTOR.

This Apparatus has been in operation some considerable period at the **Avon Street Station of the Bristol United Gas Company,** where it has been thoroughly tested, and found to give entire satisfaction. Drawings and particulars on application. (*Address as above.*)

TESTIMONIAL.

Bristol United Gaslight Company, Avon Street Station,
Dec. 2, 1889.

Messrs. Kirkham, Hulett, and Chandler, Ltd.,

Gentlemen,—In reply to your enquiry as to the efficiency of the "Standard" Tar and Impurity Extractor fixed at this Station, I have pleasure in informing you that, ever since the apparatus has been at work, it has given entire satisfaction, as it removes every particle of Tar and a large proportion of H_2S and CO_2, the additional back pressure being only one inch.—I am, Gentlemen, yours truly, (Signed)

E. J. Lloyd.

Sole Manufacturers of

GREENAWAY & KITT'S

Patent Four-Slide Exhauster and Pump.

The most perfect and simple Gas Exhauster, there being no perceptible Oscillation or Variation, and a constant pressure with a steady Gauge maintained on the Outlet.

ADDRESS AS ABOVE.

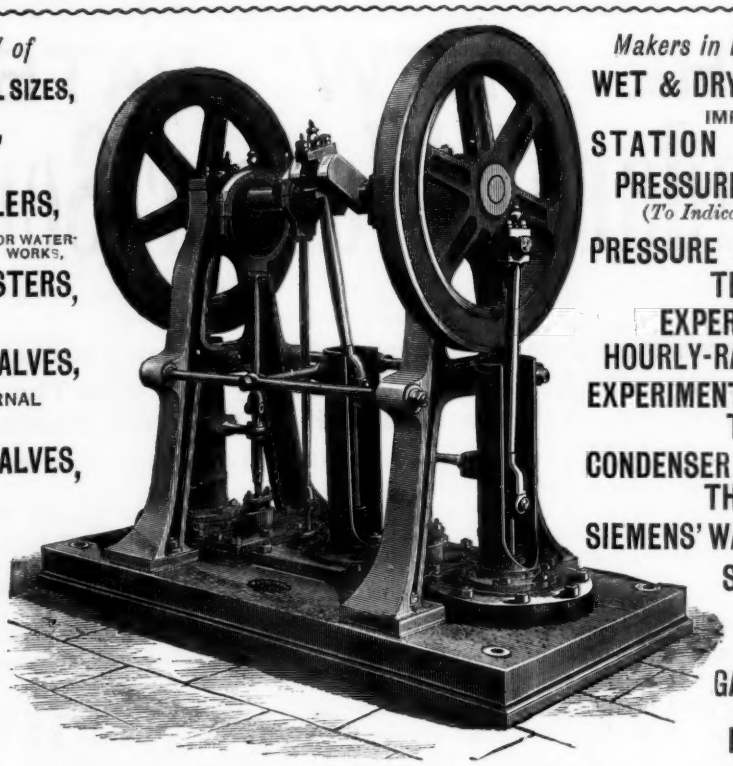
R. LAIDLAW & SON,

GAS AND WATER ENGINEERS.

Manufacturers of **GAS APPARATUS** of every Description.

Makers in GLASGOW of

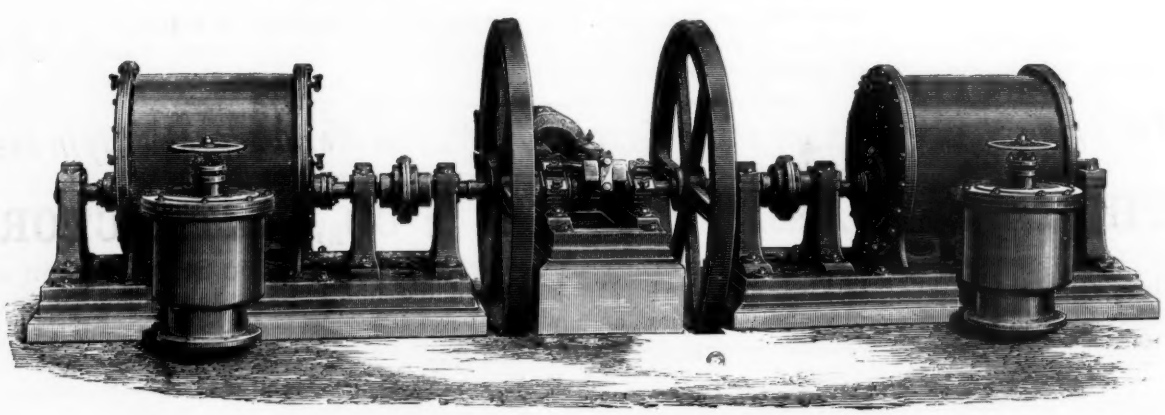
CAST-IRON PIPES, ALL SIZES,
LAMP PILLARS,
STEAM-ENGINES AND BOILERS,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
DOUBLE-FACED SLUICE VALVES,
INTERNAL AND EXTERNAL RACK OR SCREW SLIDE VALVES,
CAST-IRON COLUMNS,
BEAMS, GIRDERS, AND WATER-TANKS,
WROUGHT-IRON TUBES, FITTINGS, &c.



Makers in EDINBURGH of

WET & DRY GAS-METERS,
IMPROVED STATION GOVERNORS,
PRESSURE REGISTERS (*To Indicate New Time*),
PRESSURE GAUGES,
TEST HOLDERS,
EXPERIMENTAL HOURLY-RATE METERS,
EXPERIMENTAL TEST METERS,
CONDENSER THERMOMETERS,
SIEMENS' WATER-METERS,
STREET LANTERNS,
And all Kinds of GAS APPARATUS AND FITTINGS, &c.

PUMPING GAS EXHAUSTER AND ENGINE COMBINED. All Sizes.



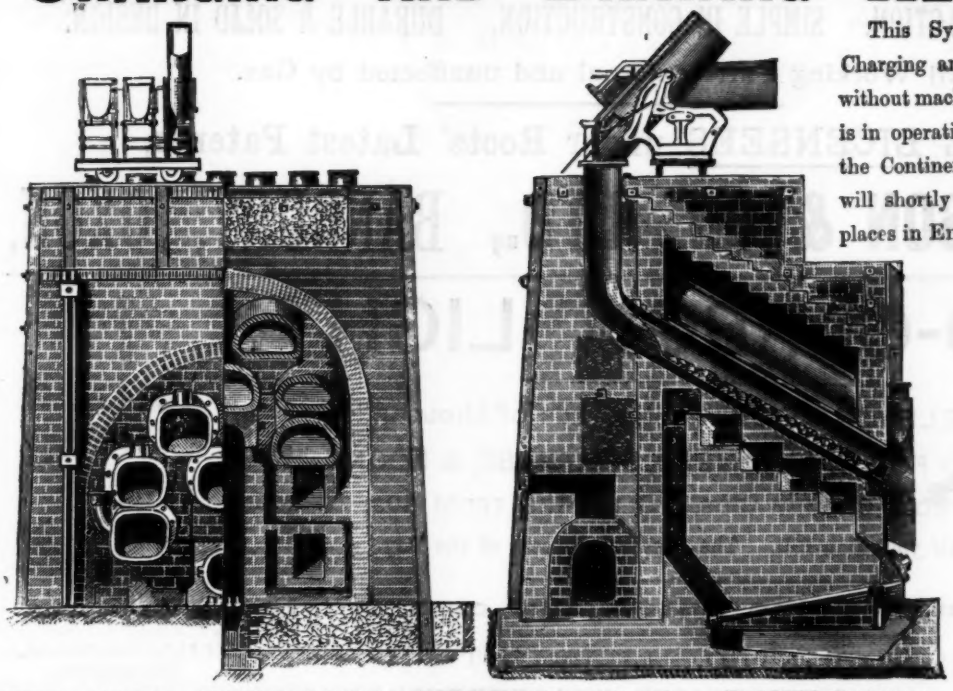
BEALE'S GAS EXHAUSTERS AND ENGINE COMBINED. All Sizes.

Prices, with full Particulars, will be given on application.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,
INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

COZE'S AUTOMATIC SYSTEM
OF
CHARGING AND DRAWING RETORTS.



This System of Automatically Charging and Discharging Retorts, without machinery or arduous labour, is in operation at several places on the Continent and in America, and will shortly be at work in various places in England.

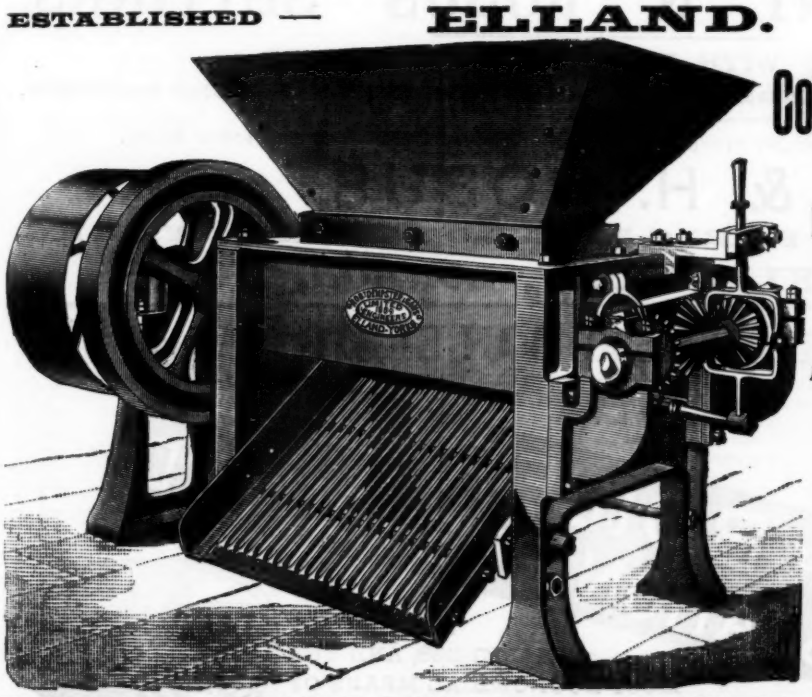
All information as to advantages, cost, royalties, &c., can be obtained from the undersigned.

The System is fully patented, and any infringer will be strictly proceeded against.

GOLD MEDAL,
Paris Exhibition, 1889.

THE COZE SYNDICATE, LIMITED, 86-88A, LEADENHALL STREET, E.C.

R. DEMPSTER & SONS, Ltd.,
ROSE MOUNT GAS ENGINEERING WORKS,
ESTABLISHED — ELLAND. — 1855.



A
Coke-Breaking Machine
Of this type has been made for
Messrs. BRUNNER, MOND, & Co., LTD.,
CHEMICAL MANUFACTURERS,
NORTHWICH,
And has given GREAT SATISFACTION.

Ours is a Strong, Reliable Machine, and WE GUARANTEE it to be THOROUGHLY EFFECTIVE and SATISFACTORY in every respect.

The above illustrates our IMPROVED COKE-BREAKING MACHINE, which is capable of breaking upwards of 30 Tons of Hard Coke in 9 hours, with a minimum make of Breeze. It is adapted for Breaking the Coke to any required size.

For Prices and further Particulars, apply to DEMPSTERS', ELLAND.

ROOTS' PATENT "ACME"

GAS EXHAUSTERS.

POSITIVE IN ACTION. SIMPLE IN CONSTRUCTION. DURABLE & SOLID IN DESIGN.

All Working Parts external and unaffected by Gas.

SOLE LICENSEES under Roots' Latest Patents,

SAMUELSON & CO., LTD., BANBURY, OXON.

ALBO-CARBON LIGHT.

ESTABLISHED ELEVEN YEARS. Hundreds of thousands in use.

UNEQUALLED FOR BRIGHTNESS, SOFTNESS, & ECONOMY.

SINGLE LIGHTS FROM 6S UPWARDS. CLUSTERS FROM 40S. TO 145S.

SAVE half your Gas Bill. The Greatest Success of the Day.

Albo-Carbon, genuine fluted, 18s. cwt., 3d. lb.

AGENCIES GRANTED. LIBERAL TERMS.

4-Light Shop Pendant. 52s. complete.

FOR PRICES, ETC., ADDRESS

ALBO-CARBON LIGHT COMPANY, LIMITED, 74c., JAMES STREET, WESTMINSTER, S.W.

RETORT SETTINGS IMPROVED

BY ADOPTING

THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.

HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

J. & H. ROBUS,

CONTRACTORS FOR GAS AND WATER WORKS,

20, BUCKLERSBURY, LONDON, E.C.

Sample Drums 20s. per cwt. d/d.

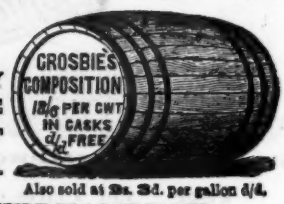
USED IN 1500 BOILERS.

Used at the following Gas-Works:—Ascot, Birmingham, Broadstairs, Leven, N.B., Pembroke, Seaham Harbour, Stamford and by leading Engineers throughout the Kingdom.

BY USING CROSBIE'S BOILER COMPOSITION.

BOILER INCRUSTATION PREVENTED

ABSOLUTELY HARMLESS, AND THE MOST ECONOMICAL MEANS OF PREVENTING INCRUSTATION OBTAINABLE.



Also sold at 2s. 3d. per gallon d/d.

ADOLPHE CROSBIE, Walsall Street Chemical Works, WOLVERHAMPTON.

The Pembroke Gas Company write: "Your Boiler Composition is giving satisfaction."

Messrs. Pease & Partners, Ltd., Colliery Owners, write: "Your Composition has given satisfaction wherever we have used it."

TANGYES LIMITED

CORNWALL WORKS, BIRMINGHAM.

LONDON: 35, Queen Victoria Street, E.C.
NEWCASTLE: St. Nicholas Buildings.
MANCHESTER: Deansgate.
GLASGOW: Argyle Street.
PARIS: Place de la Republique.
SYDNEY: 119, Bathurst Street.
MELBOURNE: Collins Street West.

SOLE MAKERS OF THE

"SPECIAL" STEAM PUMP

FOR PUMPING

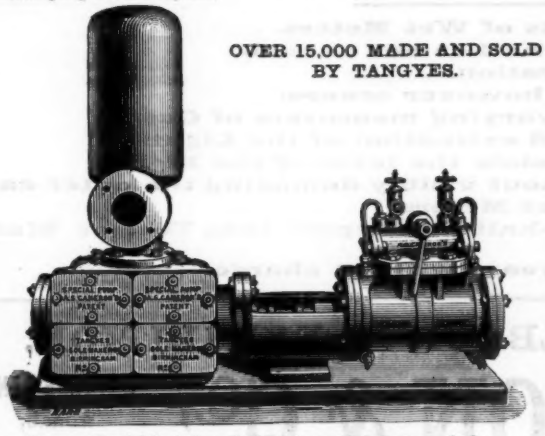
AMMONIACAL LIQUOR, TAR, & WATER IN GAS-WORKS.

Used in the Principal Gas-Works in the United Kingdom.

REDUCED PRICES.

The "Special" Double-Acting Steam-Pump is now made in some 250 sizes, and of many different designs, to suit particular requirements.
In ordering, state the purpose for which the Pump is required, to ensure suitable pump valves being sent.

OVER 15,000 MADE AND SOLD BY TANGYES.



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Diam. Steam Cyl.	ins.	3	3	4	4	4	5	5	5	5
Diam. Water Cyl.	"	1½	2½	2	3	4	2½	3	4	5
Length Stroke . .	"	9	9	9	9	9	12	12	12	12
Gals. per hour, approx.		450	1800	800	1600	3200	1250	1800	3200	5000
Diameter Suction and Delivery . . .	ins.	1	2½	1½	2½	2½	2	2½	3	3½
Price	£	9	12	11	13	15	15	16	19	22

Diam. Steam Cyl.	ins.	6	6	6	6	7	7	7	7	7
Diam. Water Cyl.	"	3	4	5	6	3	4	5	6	7
Length Stroke . .	"	12	12	12	12	12	12	12	12	12
Gals. per hour, approx.		1800	3200	5000	7200	1800	3200	5000	7200	9800
Diameter Suction and Delivery . . .	ins.	2½	3	3½	4	2½	3	3½	4	5
Price	£	17	20	23	26	19	22	25	28	34

Diam. Steam Cyl.	ins.	8	8	8	8	8	9	9	9	9
Diam. Water Cyl.	"	4	5	6	7	8	5	6	7	8
Length Stroke . .	"	12	12	12	12	18	12	12	12	18
Gals. per hour, approx.		3200	5000	7200	9800	12800	5000	7200	9800	12800
Diameter Suction and Delivery . . .	ins.	3	3½	4	5	6	3½	4	5	6
Price	£	24	27	31	36	43	29	34	39	46

Diam. Steam Cyl.	ins.	9	10	10	10	0	10	10
Diam. Water Cyl.	"	9	5	6	7	8	9	10
Length Stroke . .	"	24	12	12	12	18	24	24
Gals. per hour, approx.		16200	5000	7200	9800	12800	16200	20000
Diameter Suction and Delivery . . .	ins.	7	3½	4	5	6	7	8
Price	£	56	32	37	42	50	60	67

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These Exhausters are supplied with or without Engine. The smaller sizes (Nos. 1 to 6), when supplied with Engine, are mounted on strong cast-iron base plate—as illustrated—which also carries the Engine.

No.	Cubic Feet per Hour.	Inlets and Outlets.	Horse power of Engine.	PRICE.
1	2,000	3 inches.	2	£60
2	3,000	4 "	2	65
3	5,000	5 "	2	75
4	7,500	6 "	2	80
5	10,000	7 "	3	95
6	15,000	8 "	3	115
7	20,000	9 "	4	125
8	30,000	10 "	6	175
9	40,000	12 "	8	210
10	50,000	14 "	10	260

Prices of larger sizes on application.

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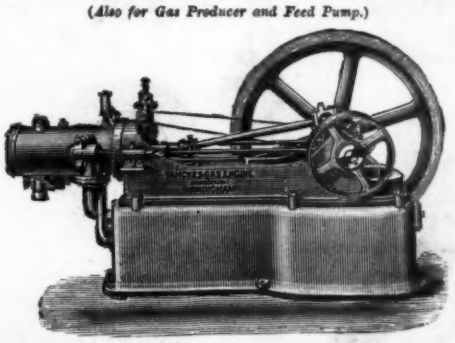
(ROBSON'S PATENT)

Royal Cornwall Polytechnic Special Gold Medal, 1882.

(*Also for Gas Producer and Feed Pump.*)



The ½, 2½, and 4 horse power sizes are of the type shown in illustration. The 1-horse power size is of the type of the "Tangye" Steam-Engine.

Working size	½ H.P.	1 H.P.	2½ H.P.	4 H.P.
Test Horse Power	1	1·4	3	6
Revolutions per minute	180	170	170	160
Price, Engine on Base with Tank £	60	82	115	140

Note.—The Test Horse Power in the table above is that given off at the Driving Pulley in actual test with Dynamic Brake at our Works

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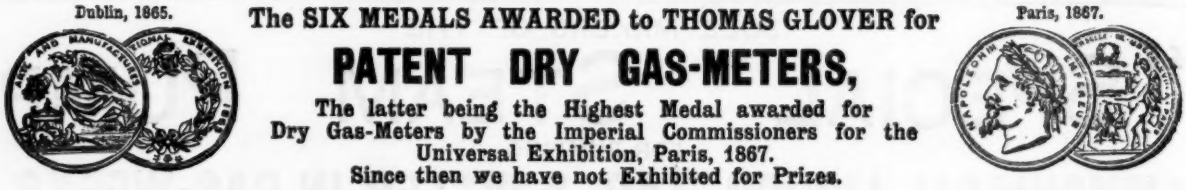

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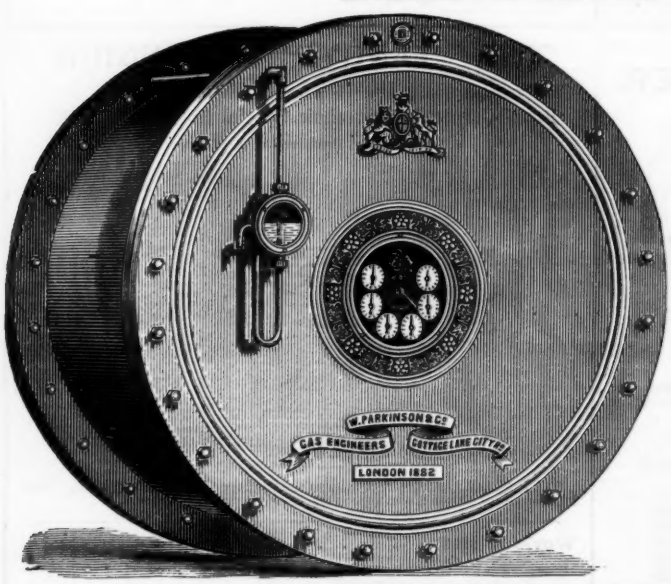

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CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

British Capital for Foreign Gas-Works . . . 481
The Threatened Strike of Coal Miners . . . 482
The Gas Institute Circular . . . 482
The South-Western Association Meeting . . . 482
Economic Science in Relation to Gas Supply . . . 483

WATER AND SANITARY AFFAIRS—

The Proposed Inquiries into the Metropolis Water Supply . . . 483
The Quinquennial Reassessment and the Water Companies' Charges . . . 483
The Warrington Corporation and the Water-Works . . . 484

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market . . . 484
Electric Lighting Memoranda . . . 484
The Influence of an Idea . . . 485

NOTES:—

The Steel of the Forth Bridge—Wind Pressures . . . 486
The Storeage of Naphtha in Water-Gas Works . . . 486
Professor Armstrong on Coke for Domestic Fires . . . 486

COMMUNICATED ARTICLES:—

The Conveyance of Coal and Other Solid Materials in Gas-Works. By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S. . . . 488
Electricity in Boston. By An American Correspondent . . . 489

TECHNICAL RECORD:—

Midland Association of Gas Managers—Annual Meeting in Birmingham—General Business . . . 490
Mr. C. Meiklejohn on Chance's Sulphur-Recovery Process . . . 493
South-West of England District Association of Gas Managers—Half-Yearly Meeting at Swindon—Abstract Report of Proceedings . . . 491

REGISTER OF PATENTS:—

Manufacture of Gas for Illuminating and Heating—Dinsmore, J. H. R. . . . 496
Starting Gas Engines—Partridge, M., and Brutton, R. H. . . . 496
Balls or Lumps for Gas Fires—Main, R. B. and A. P., and Darwin, H. . . . 496
Gas Stoves for Heating and Cooking—Clarke, T. E. . . . 496
Patent Notices . . . 497

CORRESPONDENCE:—

The Gas Institute and their late Secretary . . . 497

PARLIAMENTARY INTELLIGENCE:—

House of Lords—Progress of Bills . . . 498
House of Commons—Progress of Bills; The Quinquennial Reassessment and the London Water Companies' Charges . . . 498
House of Lords Committee—Baildon and Dewsbury Water Bills . . . 498

LEGAL INTELLIGENCE:—

High Court of Justice—
Chancery Division—Lothammer Gas Manufacturing Company, Limited . . . 499
Queen's Bench Division—Mayor, &c., of Salford *v.* Lever . . . 499
Derby Police Court—The Supply of Gas Company's Accounts to the Public . . . 500

MISCELLANEOUS:—

Presentation to Mr. Frank Livesey . . . 501
Dewsbury Corporation Gas-Works—Presentation to the Engineer . . . 501
Meeting of the Crystal Palace District Gas Company . . . 501
Provincial Gas Companies . . . 502
Colonial Gas Undertakings . . . 503
The Heywood Corporation and their Former Gas Engineer . . . 503
Oldbury Local Board Gas Supply . . . 504
Leicester Corporation Gas and Water Supply—Half-Yearly Statement . . . 504
The Proposed Transfer of the Cardiff Gas-Works to the Town Council—The Terms of the Corporation . . . 505
Gas *v.* Electricity for Public Lighting—Street Lighting in Paddington . . . 505
The Electric Light Question at Leamington . . . 506
The Warrington Corporation and the Water-Works . . . 507
Proposed Purchase of the Maidstone Water-Works by the Local Board . . . 507
The Inquiry at Sheffield into Lead-Poisoning by the Water Supply . . . 508
Current Sales of Gas Products . . . 509
Notes from Scotland . . . 509
Gas and Water Companies' Stock and Share List . . . 510

PARAGRAPHS.—The London County Council and Subways and Overhead Wires, 483—The Rating of Municipal Water-Works, 484—An Electrical Engineering Scholarship, 485—The Post of Gas Engineer at Dewsbury, 485—Death of the Former Water Engineer of the Batley Corporation, 485—The Tansa Water Scheme, 486—The Society of Chemical Industry (London Section), 487—The Managership of the Colne Gas and Water Works, 487—Ironmongers' Exhibition, 487—The Board of Trade Model Electric Lighting Order, 487—The Corporation of London and the Water Companies, 487—The Sewage of London, 487—Copper Sulphate in a Gas-Stove Flue, 487—The Utilization of Public Lamps for Sewer Ventilation, 487—The Quinquennial Investigation into the Manufacturing Operations of the Paris Gas Company, 487—The Manufacture of Gas and Electric Light Fittings, 487—The Quinquennial Reassessment of the Metropolis and the Water Companies' Charges, 487—The Discovery of Coal in Kent, 489—Gas and Electric Light Undertakings in Massachusetts, 489—Death of an Eminent American Civil Engineer, 490—The East Greenwich Gas-Works' Men and their Engineer, 490—New England Association of Gas Engineers, 492—The Cost of Municipal Electric Lighting in Paris, 492—Société Technique du Gaz en France, 495—Death of Mr. E. E. Phillips, of High Wycombe, 495—The Belfast Corporation and Electric Lighting, 497—Increase in the Price of Gas at Burslem, 497—Gas Consumers' Liabilities on a Change of Tenancy, 497—The Proposed Electric Lighting of Hackney Workhouse, 497—The Northern Coal Trade, 497—Lymm Local Board Gas-Works, 497—The Proposed Royal Commission on the Salford Gas Frauds, 407—Increase in the Price of Gas at Mossley, 497—The Salford Strike and the Gas Profits, 497—Gas-Meter Rents in Burnley, 499—New Joint-Stock Companies, 499—The Minerals under the Doncaster Water-Works, 500—Carlisle Gas and Water Works Benefit Society, 500—Sanitation in the East, 503—The Electric Lighting of Drogheda, 504—Sowerby Bridge Water Supply, 594—Stapleford and Sandiacre Water Supply, 505—Serious Leakage at the Rivington Aqueduct of the Liverpool Corporation, 506—Gas and Electric Lighting at Rochdale, 506—Pontefract New Water-Works Scheme, 506—Sale of Shares, 507—The Collapse of the Negotiations to Purchase the Canterbury Gas and Water Works by the Corporation, 507—The Douglas (Isle of Man) Town Commissioners and the Water-Works, 509—Electric Lighting at Reading, 510—Rejection of the Plymouth Corporation Water Bill by the Ratepayers, 510—The Water Supply and Sewerage of Buckingham, 511—Croydon Town Improvements and the Surplus Water-Rates, 511—Proposed Extension of the Malvern Water-Works, 511.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 18, 1890.

British Capital for Foreign Gas-Works.

THE present condition of the capitalist who wishes to invest his money in gas property, is peculiar. The gas undertakings owned by statutory Companies in the United Kingdom are such safe investments, and the rights of the proprietors are so counterbalanced by provisions for the public, that for many years there has been no opportunity for making a good stroke by operating in the home gas market. There can be no new British Gas Companies of any importance. Consequently, it is not to be wondered at that a good deal of attention should be paid by British capitalists to American and Colonial gas undertakings. At the present time a large amount of English capital is stated to be going to the United States for the purchase of gas-works that have been established by small native Companies; and something similar is also in progress in Australia and at the Cape. The conditions of the investments are seldom the same in America and in the Colonies. In American gas speculations, the British capitalist is asked to purchase, at a premium, property that has been created by astute pioneers; and consequently a good deal of the capital of the Anglo-American Gas Companies must be "water." This is nothing to a Yankee financial operator, who is generally a very Aquarius in his business methods; but it is not a reassuring reflection for those who are invited to entrust their money to him. It should never be forgotten, by those who are asked to invest in American gas-works "securities," that real estate, plant, and machinery can only be worth money for their revenue-earning capabilities, and that, as a general rule, American Gas Companies have no statutory guarantee. The recent experience of the St. Louis Gas Company—itself a consolidated concern with a capital representing much more than has ever been spent upon the works—is significant of the perils that such an undertaking must run. Without a word of warning or excuse, a project for creating a new Gas Company for the supply of the city, with power to sell their works to the Municipality, was rushed through both Houses of the local governing body, and only prevented from becoming law by the veto of the Mayor. The circumstances attending this transaction were freely exposed, and the authors denounced by the local press. It was called "the St. Louis Gas Steal;" and, notwithstanding that it was recognized as an outrage, it was doubtful whether the Mayor would see fit to quash it. One cannot have the slightest objection to the employment of British capital in the advancement of gas lighting in the United States (there is plenty of it, and little use for it in British gas-works, unless investors will be content with hardly more return than they could expect from Consols); but it is necessary to warn American operators who look to reap a golden harvest from the arrangement of such transactions, that until they are prepared to demonstrate the existence of a reasonable amount of security for money so sunk, they will do but a speculative business. English people who have money in home Gas Companies are not familiar with the conditions of competition in gas supply which prevail universally in the States, frequently attended by aggravating circumstances of official corruption and other troubles. The average Yankee only laughs when the foreign investor is swindled by a 'cute compatriot; and the victim of misplaced confidence can get no redress from "strikers," whose exploits are possibly only a repetition of incidents in the previous history of the Company in which their victim has placed money. All this should make the "Britisher" think twice or thrice before parting with his money to Yankee financial agents of whom he knows little, for investment in gas properties of the value of which he can know less.

The case is different with Colonial ventures. These have generally to be started with British capital; so that if the investor puts down too much money, he at least knows where it goes. The drawback is that there is longer to wait for a return in these cases than when an undertaking can be purchased as a going concern. It is doubtful, moreover, if towns grow quite so thickly or so fast anywhere as in the New South, South-West, and West of the United States. Yet the development of the regions lying at the back of the Cape is little short of marvellous; and the Australian colonies require more gas every year. In all these regions, moreover, a Gas Company can, in a manner, make their own terms. They may not be free from risk of competition; but the peculiar facilities for giving trouble to gas proprietors which seem to be the pride of the States, have only weak and futile analogues elsewhere. It is idle to expect that the gas industry in any new country will receive the endowment of security which was given to it in England at a time when the fundamental principles of such undertakings had not been settled from experience of the way to get the best results. New Socialistic views of the limitations of the right of private property in undertakings of a semi-public nature may

effect great changes in the conditions of the charters of new Colonial Gas Companies; but there is no probability of systematic robbery being sanctioned by Anglo-Saxon communities. The opportunities left for this in the States are due to misunderstanding and carelessness, not to design; it is for capitalists and their advisers to see now that they are not caught in the traps set for the unwary wherever money brings a high return, and especially in connection with the gas business of the United States.

The Threatened Strike of Coal Miners.

THE unsettled condition of the coal trade mentioned in these columns last Tuesday was brought to a climax at the end of the week, when the miners' representatives decided to insist upon an advance of 10 per cent. on their wages, but offered to take it in two equal instalments of 5 per cent. each—one to be given immediately, the other in July. This demand was to be finally considered by a meeting of Federated Owners in London yesterday; and upon the reply of this meeting will depend the future action of the men. Up to Saturday evening it was reported that the Yorkshire coal-owners had definitely refused the advance; and that, in consequence, 60,000 men came out on strike. The Lancashire coal-owners were divided at the end of the week between those who agreed to give the advanced pay, and others who had refused it. This want of union seems to show weakness in the owners. In the North Staffordshire district it is believed the men will obtain the advance; and there is disunion among the owners in the Bristol district. How much longer these industrial squabbles will be tolerated before a mutually satisfactory wages schedule is agreed upon by masters and men, remains uncertain; but in so far as the strikes arise out of selfishness on the part of the men conflicting with selfishness on the part of their employers, they are a scandal to our civilization. With regard to the comments that have been made upon the difficulty of the coal trade due to the policy of some Gas Companies and Corporations with regard to their irregular monthly deliveries of coal, we can point to many occasions when we have protested against this system. Coal-owners have over and over again declared that if purchasers of gas coal would only take their supplies regularly through the year, or chiefly in the summer months, instead of insisting, as some do, upon delivery according to their current requirements, they could work their pits to much greater advantage, both to themselves and their men, and could take such contracts at a cheaper rate. This reduction in price has not been sufficient to cure some buyers of gas coals of the bad habit of taking their supplies from hand to mouth; and, indeed, so long as it remained a question of a few pence per ton, it was open to gas makers to elect whether they would pay the lower price, or incur the extra expense of storing coal for winter use. Those who had the choice of such alternatives naturally rejected the latter; but the time has come when other considerations than price must be taken into the account. The last winter's strikes have opened the eyes of gas makers everywhere to the necessity for keeping at least a month's stock of coal on hand; and this means summer deliveries, which is exactly what the coal-owner asks for. The hand-to-mouth system of taking in supplies of gas coal plays into the hands of strikers inside and outside the gas-works, besides pressing unfairly on coal-owners and miners. It is not the great southern or foreign gas-works that offend in this way. These generally keep large stocks, and lay them in during the summer months. It is, indeed, obligatory upon most Continental Gas Companies to keep stocks of coal of prescribed amounts, in order that their towns may not be plunged in darkness if wars or tumults should block ways of communication for a short time. Many gas makers situated conveniently near coalfields have forgotten all such considerations. The possibility of a sudden stoppage of their customary supplies has never occurred to them, or has been dismissed as outside the bounds of practical politics. This subject was dealt with in our "Correspondence" columns last week; and if, as was then hinted as possible, the Federated Coal-Owners refuse to take gas coal contracts requiring unfairly apportioned monthly deliveries, they will be supported by all clear-sighted gas administrators. There are many very smart people, in the gas industry as elsewhere, who cannot see an advantage that lies one single inch beyond their very noses. These are the gentlemen who are most badly shaken up when strikes and lock-outs upset the jog-trot of trade, which allows them to cut and carve their business arrangements with due regard to microscopic economies. We do not hesitate to declare that the arrangement of gas coal contracts in the manner condemned by our correspondent last week is as short-sighted and outrageous of the principles of good gas management as it is of public policy. If coal getting and transportation were a purely mechanical operation, so that the gas manager could, by turning a key, pour more or less coal into his retort-houses, like water from a reservoir, then he might neglect all but his immediate requirements. Since, however, coal mining is a complex industry, largely dependent on the co-operation of human beings, it cannot be treated satisfactorily by methods that are only suitable for machinery.

The Gas Institute Circular.

THE usual spring circular to the members of The Gas Institute has been issued by Mr. W. Longworth, of Guildford, the Honorary Secretary. It begins by introducing the new Secretary, Mr. W. H. Harvey, B.A., and mentions the new address of the Institute in Westminster Chambers, from which the ordinary business is henceforth to be carried on. The question of the cost of this establishment, and of the value to be obtained for the outlay, will probably exercise the mind of more than one member. We do not forget the remarks that were made upon the working expenses of the office and secretarial department of the Institute during the old *régime;* and now that these are to be considerably increased by the policy of the Council, it is but reasonable to suppose that the latter are prepared for criticism on the point. The circular goes on to remind members that the next annual general meeting will be held at Ryde, Isle of Wight, on Tuesday, June 17, and following days (which happens to be the time when the Société Technique will be meeting in Lyons), and urges them "to exert "themselves in providing an abundance of interesting "and instructive papers." The list of suggested subjects for papers is the same as that which was formerly sent out by Mr. Bennett, who will doubtless appreciate this delicate testimony to the value of his services to the Institute. Suggestions are invited for the award of the Birmingham Medal. No such objection as was raised last year can now be alleged against the competence of the Council to make the award; and we wish them well through one of the most difficult of their responsibilities. An appeal is made for the Benevolent Fund; and it is but doing justice to all concerned to say that the solicitude displayed by both sides throughout the late "unpleasantness" for the maintenance of the fund is creditable to those who found in charitable offices a common ground. In concluding his appeal, Mr. Longworth thanks the members for their kindness to him while performing active secretarial duties, and bespeaks similar consideration for his successor. He appears to remain Honorary Secretary; but as the opportunity has been taken for circulating a copy of the proposed amended rules, which will be submitted for adoption at the June meeting, it will not be too late for members to reconsider the matter of thus dividing the secretarial duty and responsibility. It is unnecessary to comment upon the amended rules, which have been prepared by a Committee, and will be settled by competent legal authority. Nothing is said in the circular about the proposed registration of the Institute under the Joint-Stock Companies' Acts; but this recommendation will probably be made to the meeting in a form to be decided upon by the Council after consultation with their legal adviser.

The South-Western Association Meeting.

THE members of the South-West of England District Association of Gas Managers met at Swindon on this day week, under the presidency of Mr. J. J. Jervis, who delivered a short practical Inaugural Address, an abstract of which will be found in another column. Following this there was a paper on the Popularization of Gas, by Mr. F. G. Dexter, of Wantage. Before the formal business of the meeting commenced a visit of inspection was paid to the works established by the New Swindon Gas Company (of which Mr. Jervis is Secretary and Manager) for the treatment of their tar. Considering the small scale of these products works compared with most tar factories, they are fairly complete; and the processes of conversion

of the tar are carried out quite as far as is generally considered desirable by Gas Companies. The meeting was addressed by Directors of the New and Old Swindon Companies, who gave the members a hearty welcome to the town. After Mr. Dexter's paper had been read and debated, the President started a discussion relative to the possibility of working a district gasholder without a trunk main, which led to a general condemnation of the idea. Interesting incidents of the meeting were the exhibition of models of West's stoking machinery, which was explained by the inventor, and of Pease's wire-rope system of guiding gasholders, which has been studied with practical intentions by Mr. Jervis. The afternoon was spent in examining the Great Western Railway engineering works, where many examples of the application of gas for trade purposes may be found. The members afterwards dined together. It was decided to hold the next meeting of the Association in Bristol.

Economic Science in Relation to Gas Supply.

An interesting address was recently delivered by the Duke of Argyll on Economic Science, in which an attempt was made to defend the position of Political Economy as a science worthy of study at the present time, while admitting that the hard-and-fast rules of the older expounders of economic principles are liable to modification. The attempt was neither better nor worse than much that has been done by the same hand in this and other branches of science. The Duke of Argyll is always in earnest. Perhaps if he tempered his earnestness with a little humour, he would be more interesting and not less instructive. He had a good deal to say on this occasion about the things that could be better done by communities than by individual effort; and he came very near the inclusion of gas supply to towns in the former category, without actually committing himself to this opinion. He did, indeed, mention water supply among the things that should only be done by the community; and although not including manufactures among these, he said that "the great question of our day was "this—whether there might not be any other branches of "economic science" that could not be better dealt with by communities. It would have been instructive to learn what are the things which the Duke of Argyll has in view as suitable for public control. If gas and electrical supply, street conveyances, and one or two other enterprises already in some places confided to public authorities, are rightly so dealt with, where should the line be drawn? Although confessedly no Socialist, the Duke of Argyll does not believe in the omnipotence and general trustworthiness of the principle of individual interest and initiative which appears to gain its highest triumphs in the wonderful combinations that go to the feeding of great modern communities. Perhaps it is safer to argue that such matters as gas supply lie on the border-line between public duties and private enterprises, and consequently cannot be treated dogmatically. As this happens to be one of those subjects that come directly under the consideration of elective local governments not composed of graduates in economic science, it is rather a pity that eminent expounders of the principles of this perplexing science take so little notice of it, but leave it to be handled at hap-hazard by men with little instruction, but charged with much responsibility for practical action.

The London County Council and Subways and Overhead Wires.—The Bill promoted by the London County Council for the construction of subways for gas and water pipes and telegraphic and other wires under the streets of the Metropolis, and for the creation of an efficient system of control over electric wires and cables above ground, will encounter stronger opposition than any other of the Private Bills now before Parliament. No fewer than 36 petitions have been presented against it—all the petitions praying to be heard. But this does not represent the full strength of the opposing forces, inasmuch as a considerable majority of the electric light companies have consolidated their opposition. The three Metropolitan and two of the Suburban (the Wandsworth and Putney and the Brentford) Gas Companies have lodged separate petitions; but the London Water Companies will appear on one, although the Southwark and Vauxhall Company have presented an independent petition. In addition to the above-named companies, thirteen railway companies, six telephone, hydraulic power, and other companies, and eighteen local and other governing authorities will be arrayed against the Bill.

WATER AND SANITARY AFFAIRS.

The Corporation of the City of London have made their proposal to the President of the Local Government Board, that he would aid their forthcoming "inquiry" into the water question, by suggesting to them the name of an expert to conduct the investigation. Mr. Ritchie has discreetly declined the ingenuous proposal, and left the Corporation to their own devices. After this stumble on the threshold, the Corporation have set the City Remembrancer to work to secure the services of a gentleman who is described as "a professional arbitrator of high stand-"ing." The "negotiation" which has this object in view need not be a very difficult matter. The County Purposes Committee have £2000 to spend; and this will suffice for the present. Members of the Court of Common Council and others may proceed to air their crotchets in the presence of the professional gentleman engaged to preside, and may flatter themselves that this kind of "evidence" will have great weight with the Legislature. The Corporation assume that the affair will be treated as a "public investigation and inquiry," when, in fact, it will be nothing more than a Committee meeting with open doors, having a paid Chairman for the time being. Perhaps, after all, this is only an ingenious device for delivering the Corporation from the meshes of that "inquiry" which the County Council are contemplating, and for which the direct authority of Parliament is being sought. The Corporation will have their own inquiry, and will be able to ignore the proceedings of the County Council, especially as the latter will have to rely for payment of expenses on the vulgar expedient of taxing the ratepayer. At least the Corporation scheme will answer this tactical purpose, though, as we intimated a short time back, the inquiry which is thus to be set on foot may so far affect the rating principle as to render vigilance on the part of the Water Companies a very necessary act of caution. As we shall show a few lines farther on, the Companies can make a very good reply on the question of charge; and it may be wise for them to produce certain evidence which otherwise will not be forthcoming.

The Metropolitan Water Companies are not only assailed by the Corporation of the City and the London County Council. The lesser busybodies are also at work; and the Vestry of St. Margaret and St. John, Westminster, have forged their own particular thunderbolt. This takes the shape of a circular sent to all the Vestries and District Boards of the Metropolis, seeking to gain their co-operation in attacking the established system, whereby the charge for water is levied according to "the annual value" of the premises supplied. The proposal is that a communication should be addressed to the Local Government Board, suggesting that the Government should introduce "a "short Bill," to provide that when once the rateable value of a house or tenement has been assessed, the Water Companies in the Metropolis shall not be entitled to any higher rate of charge thereon, unless where an additional consumption of water follows the increase in the rateable value. The quinquennial re-assessment of property in the Metropolis which is to take place this year, in accordance with the Valuation Act of 1869, is the exciting cause of this movement, and gave rise to a question in the House of Commons by Mr. Dixon-Hartland on Thursday last, to which Mr. Ritchie replied that no action on his part could affect the powers of the Water Companies in charging according to the rateable value. It is worth noting how deftly the Westminster Vestry have provided that, while the rate of charge may not go any "higher," the way is left open for the charge to fall lower. That this is not an impossible contingency is proved by certain proceedings at the recent Quarter Sessions of the County of London, held at Clerkenwell, with Sir P. Edlin in the chair. It appears that among the appeals under the Valuation Act on this occasion were a number of important cases, arising out of the depreciation which has overtaken riverside property. The evidence given is described as eliciting many startling instances of the effect of the competition by the Dock Companies, and of other causes, on the letting value of wharves and granaries. Accordingly, after a prolonged hearing, "large reductions" were made in all the assessments under appeal, except one, which stood adjourned. If the charge for water is not to rise with the assessment, why should it fall? Yet fall it will in these cases. The Westminster Vestry and Mr. Dixon-Hartland

have in view a probable purchase of the water undertakings by the London County Council. The revenue of the Water Companies is thus to be kept down, so as to reduce the value of the undertakings when the time for purchase comes—if ever it does come. When the property is once purchased, will there be an equal zeal for cutting down the profits? The London County Council want money; and as surely as they seek to squeeze the Water Companies, so will they squeeze the consumer when opportunity presents itself. The famous "betterment" clause of the Strand Improvement Bill, shows the readiness of the County Council to reap the utmost benefit from any rise in the value of property.

The proceedings of the Warrington Corporation in reference to the purchase of the Warrington Water Company's undertaking are remarkable. At the outset they were enshrouded in mystery; and as time has gone on the mystery has deepened, until things have now become inextricably mixed. When the Warrington Extension and Improvement Bill was drafted, it contained clauses for the compulsory acquisition of the water-works; but it soon became known that the Corporation were in treaty with the Company with a view to the arrangement of terms of purchase. The answer of the Company was that they did not want to sell. Then there came various conflicting reports. One day we were told that the negotiations were broken off, and that the Corporation would proceed with their compulsory clauses. Then it was said that the Bill would be abandoned for the present; and would be introduced in an amended form another year. After this it was reported that the negotiations were renewed; and finally it appears that the Company—still as reluctant as ever to part with their property—have agreed to accept, and the Corporation to pay, a sum of £270,000, which is equal to 30 years' maximum dividends. Since then there have been two long and somewhat acrimonious meetings of the ratepayers; the second of which voted, with practical unanimity, against the arrangement their representatives had made. There is now to be a poll of the burgesses; and, having regard to what has passed, it is surely not inappropriate that one of the chief acts in connection with this proceeding should be set down for decision on the 1st of April. It may not be altogether the fault of the Corporation or their advisers, but there is certainly not much to commend in their proceedings up to this point. They have not taken the precaution of consulting an engineer, notwithstanding that grave doubts are expressed as to the continuance of one of the present sources of supply. Nor do they seem to have had a sufficiently full and exhaustive examination of the Company's accounts, if it be true, as is alleged, that a sum amounting to nearly £3000 has been entirely omitted from the calculations. Locally there is the widest possible divergence of opinion as to the wisdom of the course which is being pursued. It is clear that the effect of the purchase will be to add a sum which may be 8d., and is certain to be at least 3½d., in the pound to the existing local rates. Having regard to this, it is not unnatural for a large section of the ratepayers to take the view that the proposed price is too high. On the other hand, there is another section who hold that the time is opportune, and that if this chance is not taken advantage of, it will not again present itself. In the midst of these conflicting views, the Corporation have the misfortune to lose the services of the gentleman who, as Town Clerk, has so far been responsible for the measure. His engagement terminates on the 25th inst.; and he has already been retained by one of the petitioners against the Bill to act on their behalf. It is an embarrassing position for the Corporation. They are, however, responsible for it; for they might have had the assistance of the Town Clerk until the Bill was disposed of. As it is, their difficulties are considerable; and their wisest course would surely be to drop the Bill, and try again another time.

The Rating of Municipal Water-Works.—At the annual meeting of the Association of Municipal Corporations last Wednesday, a resolution was passed expressing the opinion of the meeting that the Council of the Association should be requested to consider the subject of the rating of water-works belonging to local authorities, with power to adopt such measures as might be deemed most advisable to secure the amendment of the present law relative thereto.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 510.)

ANOTHER dull and flat week in the Stock Markets, although money is easy enough; the Bank rate having been lowered on Thursday to 4 per cent. It had been reasonably expected that such a rate would bring about a revival of business; but as yet there is hardly a sign of it. It must, however, be borne in mind that serious elements of disquietude are now painfully in evidence, to check the natural return of buoyancy. Chief among these are the threatening coal strike, and monetary troubles in the Western Hemisphere. The Gas Market nevertheless continues to be strong, and moderately active; and all changes in quotations effected during the past week are in the upward direction. Gaslight issues have been in good demand. "A" opened firm, and steadily, though moderately, improved; marking 253 more than once before the close. The nominal quotation, however, has only been advanced 1. The 10 per cent. preference was done at the top price; and the 7 per cent. maximum very near it. All three issues of South Metropolitan have been quite neglected; and a single transaction in the debenture stock was the only mark. Commercials also have been quite quiescent—probably from a scarcity of stock in the market. The Company's general meeting will take place on the 3rd prox., when it is anticipated that the Directors, adhering to their very prudent and sensible policy of last year, will recommend the declaration of the same rate of dividend as before, without any increase. Business in the Suburban and Provincial Companies' issues has been exceedingly limited; but their firmness is conspicuous. Notably, British has made the large advance of 2 (or 10 per cent. on its £20 shares); and Brentford old and new have improved 2 and 3 respectively. The feature among the Foreign undertakings is the considerable improvement in Imperial Continental, after a long period of indolence. On Saturday, it was marked at 220½—a figure which it has not reached in the last three years. Foreign debentures have also been in some demand; and Australians are quoted 1 better. Water stocks have been only moderately busy, and the general tendency is not quite so good. It is not improbable that the Companies may have to stand on the defensive this session.

The daily operations were: Great activity in Gaslight "A" on Monday, with good prices all round. Quotations did not, however, change. Water was fairly brisk and steady. Tuesday's business was quieter; but prices ran still better. Imperial Continental rose 1½. Water was untouched. Transactions in Gas were even more restricted on Wednesday; but the rise in value proceeded. Imperial Continental advanced 2; Gaslight "A," 1; and Bahia, ½. There was nothing noticeable in Water. Things remained about the same on Thursday in the Gas Market; the only change being a further rise of ½ in Imperial Continental, though a similar rise was erroneously attributed to Buenos Ayres. There was nothing at all in Water. Rather more was doing on Friday. Brentford new rose 2; British, 1. Water was flat, and both Southwark and Grand Junction receded. Gas was animated and buoyant on Saturday. Brentford old rose 2; ditto, new, 1; British, 1; and Imperial Continental, 2. Water was without further change.

ELECTRIC LIGHTING MEMORANDA.

The National Electric Light Association of the United States—Defects of the Alternating Transformer System—Gas Lamp-Posts to be Converted into Electrical Police Alarms.

THE National Electric Light Association of America have just held their eleventh semi-annual meeting; for, like many other new technical societies, they find the whole year too long an interval between their gatherings. The Association has no counterpart in Europe; for the very good reason that nowhere out of the United States can there be found a sufficient constituency for such an organization. It is not, strictly speaking, a scientific body, but resembles the ordinary Gas Managers' Associations of the country. The object of the members in meeting is purely business; and the society probably exists for the purpose of bringing buyers and sellers of electrical machinery together in a more intimate way than can be effected through travellers or by advertisements. It transpired at the recent meeting (which, for the convenience of the Western members, was held at Kansas City) that at the beginning of the current year the estimated capital investment in the various electrical industries of the United States was $600,000,000; giving employment to 250,000 persons. These are good mouth-filling totals, and would probably bear a heavy discount if it was a question of assessing a tax upon either money or men. Of course, these figures embrace all possible descriptions of electrical work—telegraphy, telephony, and electrical railways, as well as lighting. Deprecatory reference was made to the question of subways *versus* poles for carrying electric wires, which is one of the topics of the time in all American communities. It was very generally admitted that the poles must in time disappear; but they were apologized for as necessary to the beginnings of any branch of electrical business. We take leave to remark that most of the existing electric light concerns of the States will disappear with the poles, for they are a mushroom brood that would never have sprung up in communities

where the rights of the public against speculators are better guarded than they are in the United States, and can hardly make a living even there. It is difficult for an Englishman to understand how the objectionable poles came to be tolerated at all in American towns. He is accustomed to see them in his own country by the side of rural and village roads; but where there is anything like a street, the poles vanish and the wires are carried over the housetops. It is impossible to glance up at the sky anywhere in London or in a populous town of the United Kingdom without observing a network of lofty wires cutting the aerial perspective; but these are not really in anybody's way. If the same system had been followed in America, perhaps the present troubles in connection with overhead wires would not have arisen. It may assist in marking clearly the difference between the English and American systems of overhead wiring if we call the former the high-level, and the latter the low-level system.

The alternating transformer system is getting some very nasty knocks from different quarters. Recently the attention of the Board of Trade was called to an example of a transformer fastened against the wall near a shop door, in such a position that anybody, by accident or design, could lay hold of the main line terminals, and receive a fatal shock. It is evident from this incident that the fixing of transformers on consumers' premises must be subject to careful official inspection. The degree of immunity enjoyed by the users of this system of distribution from risk of the main current breaking down the transformer, and entering the premises, has not yet been ascertained; but it is becoming understood that accidents of the kind may be expected occasionally. With regard to the efficiency of alternating currents for arc lighting, a Commission sitting at Frankfort-on-the-Maine has determined that Schuckert continuous-current lamps are more efficient than Ganz alternating arc lamps in the ratio of 4 : 3. This difference is not only due to the superior electrical efficiency of the former lamp, but also to the fact that in a direct-current lamp the irradiation is principally downwards at angles of from 40° to 60° with the horizon, while in an alternating lamp half the light is projected obliquely upwards, and the other half of it obliquely downwards.

A curious combination of electricity and the gas lighting service is suggested in Morgan's Automatic Electric Police-Signalling System, recently described in the *Electrical Review*. It is often remarked that a gas-lamp is as good, for public protection, as a policeman; but Mr. Morgan aims at making the one directly assist the other agent of public security for the enhancement of the value of both. The idea is that certain special street lamps shall be electrically connected with each other and with the nearest police station, in such a way that any policeman or other authorized person—say, a householder provided with the necessary key—shall be able to give warning, from one such lamp through the rest, of the occurrence of "fire," "burglary," "murder," or what not. One lamp of the kind is supposed to be placed in every street, or at every important crossing, so that the policeman on the beat shall always have one of them under observation. It is unnecessary to describe the fittings of these lamps and their manifold uses. Suffice it to say that the attention of the watcher is attracted by the exhibition of a red light when a signal is to be made. This is effected by the electric current raising a cylinder of ruby glass round the gas-burner before transmitting the message, whatever it may be. Every lamp is fitted to act as a receiver as well as transmitter of signals. The inventor argues that his system would treble the utility of the police force in a populous place, and would be cheap in the money it would cost. The practicability of sprinkling a number of signal lamp-posts throughout a town, every one requiring direct communication with a police station by means of a separate wire, is not apparent on the surface of this proposal; although, in a sense, it is only an amplification of the system of electrical fire-alarms in use in all great cities.

An Electrical Engineering Scholarship.—Sir David Salomons has offered to devote £1000 to the foundation of an electrical engineering scholarship; the management of the matter to be left in the hands of a Committee of the Council of the Institution of Electrical Engineers.

The Post of Gas Engineer at Dewsbury, vacant by the removal of Mr. Henry Townsend to Plymouth, has been filled by the re-appointment of Mr. C. A. Craven, lately Manager of the Pernambuco (Brazil) Gas-Works. Mr. Craven held the position down to the year 1878, returning from South America some five years ago.

Death of the Former Water Engineer of the Batley Corporation.—We regret to record the death, on the 6th inst., from paralysis, of Mr. A. Graham, formerly Water Engineer of the Batley Corporation. He had been subject to paralytic attacks for three years; and about a year ago the Corporation appointed Mr. Oscar J. Kirby as Engineer and Manager, whom Mr. Graham assisted. The deceased, who was the youngest son of the late Mr. B. Graham, of the firm of Messrs. Graham, Hirst, and Co., of the Carlinghow Cloth Mills, was highly respected, as was evidenced by the number of councillors, corporation officials, and members of the various fire brigades who attended his funeral.

THE INFLUENCE OF AN IDEA.

A CURIOUS illustration of the influence of a fermenting idea is to be observed in the progress of the improvement of gasholder design by the suppression or radical modification of the guide-framing. It is some time since we devoted any space in the JOURNAL to a review of this modern movement, and meanwhile the change that was a few years ago regarded by most engineers as chimerical, has become a commonplace of engineering, as our advertisement pages testify. It will doubtless require time for all gasholder makers to fall in with the new movement, especially as the two best-known arrangements for dispensing with the outer guide-framing of gasholders are proprietary. Contractors who do not possess workable patents of this class will naturally disparage their value, in order to keep work in their own hands; but the commercial future of this reform in the principles of gasholder construction will settle itself. We have nothing to do with this part of the question, but desire for the present merely to call attention to the remarkable practical effect that a single idea has wrought in this branch of engineering; and we do this not for the sake of unduly magnifying the value of this particular idea, which may be great or small, but in order that any reader who may at any time start a similar idea may be encouraged. In most professions, and particularly in gas engineering, there exists a robust class of critics who claim to be nothing if not "practical." They weigh everything in the same balance, and pass ideas over their weighbridge just like trucks of coal. Anything by way of suggestion that cannot be weighed in this fashion, and its value determined forthwith in current coin, they dismiss as "theoretical"—which in their mouths is a term of contempt. These critics are eminently respectable and useful in their way; but it is well to occasionally remind them and the world that they do not know everything. There are matters which cannot be weighed on a weighbridge, or measured by a two-foot rule, but which may in the fulness of time set many weighbridges and rules to work. These are fundamental ideas. Nobody can tell for certain, when a strange suggestion arises in his own thought, or is communicated by his neighbour, whether it is likely to bear fruit or not. Technical journals and the records of the Patent Office bear witness of many suggestions that never come to anything. There is no recognizable hall-mark on these productions of the mind. Not even their parentage serves to indicate their value; for the most striking thing about the life-work of every eminent man is the amount of suggestion which he produces to waste. A Siemens or a Bessemer, whose ideas sometimes create new industries, makes many more failures than successful shots; so that not even the best accredited ideas can be accepted without practical test. On the other hand, the most obscure thinker may discover a clue to an industrial advance that has escaped others. It is his duty, therefore, to give his ideas a fair chance of being heard; and fortunately the means of publication are so generally available now-a-days, that nobody need despair of a hearing for aught he may have to say that is not obviously ridiculous.

The distinction between a fertilizing idea and its practical application is radical. The idea may be expressed in a few words; but the application may take years in working out. The property in the original suggestion and in its utilization may, and generally does, belong to different people. Sometimes, but happily not always, the first discoverer essays to protect himself from the improver by patenting every imaginable modification of the embodiment of his idea; and when he has overlooked a weak spot that is taken advantage of by another, he is loud in his denunciations of the infringement. It is probable that more general good is effected when the discoverer keeps himself independent of the practical deviser of applications, whose genius is of a totally different character. We say this because it is possible that here and there may be found men who have in their minds more or less clearly-defined ideas on various industrial problems, which they are not disposed to publish for what they are worth because they have a half-wish to keep them until they can clothe them in some working shape. This day never comes. The man with the idea never succeeds in devising the practicable embodiment for which he waits; and so his idea perishes with him. It is not always that he keeps his idea to himself with a view to his personal gain. Such conduct would be undoubtedly selfish and short-sighted, but not necessarily iniquitous. It may well be, however, that the man with the idea does not keep silence through selfishness, but simply through modesty. He has the idea, such as it is, but cannot himself see what practical good it represents, and has no hope of acting upon it. He is afraid of the robust practical critics already referred to, who are sure to "sit upon" him for venturing to dabble in a "theory" which has no apparent connection with their experience; and so he keeps his own counsel, and the world is the poorer of a suggestion that somebody else might have been able to work up into a useful shape.

It will not perhaps be an undue exaggeration of the worth of the example if we cite the history of the movement for the suppression of gasholder guide-framing of the usual description, in support of the foregoing observations. About this time three years ago there appeared in the JOURNAL an article entitled, "Is Lofty Guide-Framing necessary for Large Gasholders?" which began with the statement that "the question as to what is the precise value of gasholder framing is one that has been

raised several times by engineers with a propensity for diving after abstract principles of construction, but has not yet been settled, or even placed upon the road that may lead to settlement." The gist of the article lay in a suggestion that a gasholder might be maintained in a proper working position by means of the bottom curb. It was the first promulgation of the idea of guiding gasholders from the base. And now let us pause to point out that this was no more than an idea, stated simply for what it was worth, without any attempt to apply the principle. The time was apparently favourable for the suggestion, although there had not been any prior discussion of the subject. Within the week, Mr. V. Wyatt came forward to admit the force of the suggestion, and wrote the truly remarkable words for the time: "I quite anticipate the production of a self-sustaining gasholder in the future." The fulfilment of this prophecy at Northwich and Haslingden by two different methods of gasholder guiding not then thought of, is one of the most interesting developments of modern gas engineering. It is unnecessary to do more than mention the work of Mr. George Livesey in this connection; but his remarks on the original suggestion are instructive, in view of accomplished facts. He said: "If some practicable means could be devised whereby all the bottom rollers might be made to rise or fall equally, and none of them could either rise above or fall below the others, the holder would then, to all intents and purposes, have a solid foundation, and no columns or guide-framing of any kind would be necessary." Mr. Harry E. Jones and Mr. F. D. Marshall must also be included among the few who realized the speculative value of the idea expounded in the JOURNAL article; while nobody could say that he was satisfied with the only suggestion then offered for embodying the principle. Time passed; Mr. W. H. Y. Webber's paper was read and discussed at the Glasgow meeting (1887) of The Gas Institute; and still the idea remained "in the clouds," although an increasing number of engineers came to think there was "something in it." Months afterwards, the idea showed signs of bearing fruit. Mr. W. Gadd was first in the field with a patented device for maintaining the verticality of holders without lofty guide-framing; Mr. Pease perfected a different means of attaining the same end; and the list of inventors who sought to solve the practical problem in various ways includes at least half-a-dozen other names, and might probably be largely extended. All this simmering effort, be it understood, followed the publication in these columns of a thoroughly unpractical "notion," which the original promulgator has never attempted to convert into an actual fact. In all probability the coming summer will witness a noteworthy expansion of the trade in gasholders without external guide-framing. Which will be the favourite system to be followed in this and foreign countries, is not for us to anticipate. Whether the known devices will be supplemented or superseded by others, is another question that must be left to the future to answer. At any rate, an economy of about 30 per cent. in the cost of a holder is something that no conscientious gas manager, duly solicitous for the rightful application of his employers' capital, can affect to ignore. The revolution in gasholder design has been effected; and those engineers and contractors who are specially interested in the new departure will have plenty of work from this time forward. The men who have made the new principle workable in despite of all the opposing forces of ignorance, apathy, and prejudice, deserve all the reward they will get.

In concluding this short notice of the origin and present position of the most striking reform in gas engineering practice that has been brought to pass since the existing type of gasholders was adopted, we repeat that our main object has been the encouragement of the expression of ideas by those who entertain them, irrespective of their apparent value, in a practical sense, at the time. It is not necessary to define the limits that separate from mere dreams those suggestions which have possibilities of usefulness. The line need not be drawn too closely, for the dreams of some men are worth more than the waking sense of others. Ideas relating to industrial developments are not more frequently of the nature of dreams than many of the political projects that fill the daily newspapers; and it is hard to see why an engineer as well as a politician should not be allowed his occasional flight of fancy.

The Tansa Water Scheme.—According to *Indian Engineering*, this is acknowledged to be the greatest scheme of a gravitation water supply for a city in India. The first survey was made by Major Hector Tulloch, now Senior Inspector of the Local Government Board, in 1870; but it was not brought before the Corporation as a project to be executed until July 27, 1883, when it was accepted. The area of the watershed, when the dam is completed up to the height to which it is now intended to be carried, will be about 7 square miles; while the catchment area is 52 square miles. The water from the reservoir will be led into Bombay by 5 miles of tunnels, 25 miles of ducts, and 19 miles of 48-inch mains. These will carry the water to Ghat Kooper, from which place into Bombay there will be 12 additional miles of mains. The final surveys and necessary modifications which were found to be required, were made by Mr. Clarke, the Engineer of the works, under whose immediate superintendence they are being executed.

NOTES.

The Steel of the Forth Bridge—Wind Pressures.

In the final report of Major-General Hutchinson, R.E., and Major Marindin, R.E., on the Forth Bridge, mention is made of the quality of the steel employed. As this example of the successful use of steel for structural purposes will be for many years the guide for engineers in designs for bridge, viaduct, and gasholder work on a large scale, it will be convenient to record the quality of the material. The whole of the metallic superstructure of the bridge and viaducts is composed of open-hearth, or Siemens steel, which by the specification has had to satisfy the following tests:—Strips cut lengthwise or crosswise to have an ultimate tensile strength of not less than 30 tons, and not exceeding 33 tons per square inch of section, with an elongation of at least 20 per cent. on a length of 8 inches, for all steel subject to tensile stresses; and of not less than 34 tons nor more than 37 tons, with an elongation of not less than 17 per cent., for all steel subject only to compression. Strips cut crosswise or lengthwise 1¼ inches wide, heated uniformly to a low cherry red, and cooled in water at 82° Fahr., to stand bending double in a press to a curve of which the inner radius is 1¼ times the thickness of the steel tested. According to the certificate signed by the engineers, the results of the many thousands of tests made showed the steel to be possessed of toughness and ductility considerably in excess of the specified requirements. It may be useful to record that the greatest wind pressures observed during the execution of the Forth Bridge works, as tested by a large fixed gauge, a small fixed gauge, and a revolving gauge respectively, were 27 lbs., 41 lbs., and 35 lbs. per square foot.

The Storeage of Naphtha in Water-Gas Works.

One of the most serious cares of a large water-gas company is the safe storeage of the highly imflammable and explosive petroleum used for carburetting. The difficulty is not apparent when the make of gas is small, and a few barrels in a pit, or an old boiler or two, will contain all the crude oil or naphtha that need be kept on hand. The larger the works, the greater the trouble from this cause; and with gas-works making upwards of a million cubic feet of gas daily, in a crowded locality, the housing of his oil is not the least of the manager's anxieties. It would not be too much to say that in many British gas-works it would be impossible to find room for a stock of naphtha, even if the inspectors under the Petroleum Acts would pass them for the purpose. A production of a million cubic feet of water gas per day means the consumption of at least 3000 gallons of naphtha daily; and a fortnight's stock would therefore amount to 42,000 gallons. If stored in underground tanks, surrounded by earth banks, which would probably be required in the interest of public safety, even this small stock would take up valuable room. To overcome this objection, Mr. J. Flannery, of New York, has patented a device of a naphtha tank contained in an annular gasholder tank. The naphtha store is in what would, under ordinary conditions, be the "dumpling" of the tank; and the top of the chamber has a valve for permitting the naphtha vapours to escape into the interior of the gasholder. Mr. Flannery thinks the pressure of the gasholder would act like a force-pump in discharging the contents of the naphtha chamber; but he has no clear idea of the amount of pressure given by a holder. His plan is good for saving space; but it would be easy to suggest obstacles in practical working, and to question the prudence of storing naphtha and gas under one roof, in what would be essentially the same receptacle.

Professor Armstrong on Coke for Domestic Fires.

Professor Armstrong, F.R.S., recently lectured to a popular audience on the subject of the domestic fireplace. He remarked that, like most ancient institutions that survive in these later days of progress, the common English fireplace embodies sound theoretical principles; but he observed that the fireplace is too often wasteful, and is in a large measure the determining cause of the great discomfort which arises from the prevalence of fog in all our large cities. Professor Armstrong referred to the fruitless smoke abatement agitation; and admitted that the production of smoke is inseparable from the use of bituminous fuel in common fire-grates. He explained the origin of the smokiness of bituminous coals by reference to the resinous or oily nature of the vegetation from which they are derived, and by comparing the flame of burning rosin with that of cotton wool, which is almost pure cellulose. In order to burn these smoky fuels without smoke, it is necessary to present an abundant supply of air to their flames. This is done in the cases of gas and petroleum by so arranging the rate of burning, and adjusting the air supply, that perfect combustion is secured. The gas-flame has the form of a thin flat or circular sheet given to it, which presents a large surface to the air; and in a petroleum lamp a chimney is used to create an air draught. Such arrangements cannot be made with a coal fire, only one face of which is exposed to the air. Hence it appears that many influences are at work in a fire to render combustion incomplete. In the first place, there is the shape of the flame; secondly, the dilution of the combustible gases by the products of combustion from the fire below; and in the third place, the inrush of cold air over the fire to the chimney, tending to produce the cooling effect which, by checking combustion, creates smoke. After reviewing a

variety of descriptions of so-called smoke-preventing devices for common grates, Professor Armstrong concluded that these are practically worthless, and that there is no way, short of abandoning bituminous coal, of rendering domestic fires smokeless. He said that he himself has for the past two years been burning practically nothing but coke; and that his most successful coke fire was one made with a few bricks, with a gridiron having very narrow bars as a front.

The Society of Chemical Industry (London Section) will hold an extra meeting on the 21st prox., when Professor Dewar, F.R.S., and Mr. Boverton Redwood will read a paper entitled "A Process for the Conversion of Heavy Mineral Oils into Lighter Hydrocarbons suitable for Illuminating and other Purposes."

The Managership of the Colne Gas and Water Works.—Mr. H. Simmonds, F.C.S., has been appointed Engineer and Manager of the gas and water works of the Colne and Marsden Local Board. Mr. Simmonds was a pupil of Mr. J. West, M. Inst. C.E., of Manchester, and for the past four years has been Assistant to Mr. R. O. Paterson, at Cheltenham.

The Ironmongers' Exhibition.—The international exhibition of machinery, appliances, and inventions incidental to engineers and electricians was opened at the Agricultural Hall, Islington, yesterday. There are numerous entries affecting the gas trade; and therefore a visit would not be time thrown away. The exhibition will remain open till the 29th inst.

The Board of Trade Model Electric Lighting Order.—Owing to representations made to them by the Association of Municipal Corporations, the Board of Trade have agreed to amend their Model Electric Lighting Provisional Order, so as to enable local authorities to delegate their powers to companies; but at the same time the department decline to divest the local authorities of all responsibility.

The Corporation of London and the Water Companies.—Our readers will remember that the Corporation of London a few weeks ago decided to hold a public inquiry into the subject of the water supply of the Metropolis, the charges for water, and the possibility of acquiring the undertakings of the Water Companies. It was also arranged to ask the Government to suggest the name of an expert to conduct the inquiry. Application has accordingly been made to the President of the Local Government Board (Mr. Ritchie) with this object; but he has declined to allow one of his officials to undertake the work. Negotiations have consequently been opened by the City Remembrancer, on behalf of the Corporation, with a professional arbitrator of high standing, with the view of securing his services.

The Sewage of London.—The London County Council in December last passed a resolution instructing the Main Drainage Committee to secure the services of an eminent civil engineer to join the Engineer of the Council in a thorough examination of the sewerage system of the Metropolis. The Engineers were to be asked to include in their report an approximate estimate of the cost of taking the whole of the sewage to sea. In accordance with this instruction, the Committee obtained from Mr. (now Sir) Benjamin Baker, M. Inst. C.E., his consent to act with the Council's Engineer in the matter; and this arrangement has been approved. The Chemist of the Council (Mr. W. J. Dibdin, F.I.C., F.C.S.) has requested Messrs. Sinclair, Tweedie, and Co. to prepare a scheme for dealing with London sewage. By their method the sewage is treated in transit, and the ventilation of the sewers is stated to be secured at the same time.

Copper Sulphate in a Gas-Stove Flue.—At the last meeting of the Newcastle Section of the Society of Chemical Industry, Mr. Saville Shaw exhibited a deposit of copper sulphate which had formed in the flue of a gas-stove. The stove had a copper flue. He explained the formation of the deposit—which, though greyish white, contained water nearly corresponding with that required by the formula $CuSO_4.5\,H_2O$—by supposing that the copper first oxidized, and that the copper oxide then brought about, in the way in which many metallic oxides are known to do, the combination of sulphur dioxide, from the combustion of sulphur in the gas, with oxygen; the trioxide so formed, or the acid formed from its reaction on the steam present, then forming copper sulphate with the copper oxide. Mr. Lovibond instanced a similar case which had come under his knowledge, in which the bottom of a large brewing copper was destroyed, and converted into copper sulphate, through the use of a coal containing an unusually large amount of sulphur.

The Utilization of Public Lamps for Sewer Ventilation.—The Borough Engineer of Blackpool (Mr. J. Wolstenholme) has lately reported the result of a series of tests of Worthington's sewer-ventilating lamps, which have been fixed in the Lytham Road in that town. The tests extended over the period from Dec. 11, 1889, to Jan. 16, 1890, in varying states of the weather, mostly frosty. In the majority of cases there were four gas-lights burning in the lantern; and the heat at the top of the cremating funnel was about 600° Fahr.—so great, in fact, that block tin melted in 3½, and lead in 10½ minutes. In this arrangement the base of the lamp is connected by a pipe to a chamber (furnished with pans containing disinfectants) lying immediately below the footpath, and in direct communication with the sewer. The sewer gases pass through this chamber and up the lamp-post to the flames, by which their noxious properties are entirely destroyed. If the lights are kept burning continuously, the disinfecting chamber is not required. The tests show an average extraction of gases from the sewer at the speed of 247 lineal feet per minute per lamp. The passage of the gases through the lantern has no effect whatever on the glass; consequently the light is not in any way impaired.

The Quinquennial Investigation into the Manufacturing Operations of the Paris Gas Company.—Those of our readers who followed the dispute between the Paris Gas Company, the Municipality, and the consumers a few years ago, on the subject of the price of gas, will remember that, under the terms of the Company's treaty, the Minister of the Interior has to appoint every five years a Commission to investigate the Company's manufacturing processes, with the view of ascertaining if there has been such definite improvement therein as to allow of a reduction being made in the price of gas. The present year being the first of a new quinquennial period, the above-named functionary has nominated, at the suggestion of the Prefect of the Seine, six Commissioners, one of whom is well known to many gas engineers—viz., M. Cornuault—the immediate past-President of the Société Technique du Gaz en France, and Manager of the Marseilles Gas Company. When the previous Commission was nominated in 1885, it was arranged that it should comprise two chemists, two engineers practically acquainted with the working of large industrial undertakings, and a gas engineer. The first Commission (nominated in 1880) had M. Berthelot upon it; the second being composed of MM. Violle, Darcel, Schutzemberger, Bérard, Lechatelier, and E. Coze. Whatever may be the special qualifications of the other gentlemen who have just been selected, the representative gas engineer is one whose position in his profession renders him specially suitable for the duties he will be called upon to discharge.

The Manufacture of Gas and Electric Light Fittings.—Whatever may be the opinion as to the ultimate position of the electric light as a competitor with gas as an illuminant, it is daily becoming manifest that manufacturers of gas-fittings in Birmingham, Manchester, and elsewhere, are alive to the importance of competing with the numerous firms which have been established expressly to supply fittings for electricity. We have noticed that for some time past gas lighting engineers have included the new system of lighting in their prospectuses and advertisements; and they are now as ready to supply electric fittings and lay a complete installation through a mansion as any of the firms who make this a speciality. An instance of this is afforded by Messrs. D. Hulett and Co., Limited, of High Holborn, who have gone so far as to display prominently in their shop window a 6-horse power "Otto" gas-engine and dynamo, with incandescent lights artistically arranged at intervals. This is not the only case. Such firms as Messrs. Winfield's, in the Farringdon Road, Messrs. Evered's, of Drury Lane, and many others, are utilizing their manufacturing plant, which has been put down at Birmingham at an enormous expense, for producing electrical fittings of a very effective character. Indeed, gas and electric light fittings are being made side by side; and ingenuity has gone even so far as to manufacture a combined gas and electric bracket, so that the consumer can have his choice. It will thus be seen that manufacturers of gas-fittings and kindred appliances are already in advance of their electrical competitors, because they have the means of producing artistic designs in all kinds of fittings.

The Quinquennial Reassessment of the Metropolis and the Water Companies' Charges.—An important circular-letter has been sent by the Westminster Vestry to the Metropolitan Vestries and District Boards, embodying the following resolution passed at a recent meeting:—"That, in view of the reassessment of property to be made in the present year, which in many cases will enable the Water Companies to increase their charges without giving any equivalent to the consumers, and so increase the value of their monopoly if at any time there should be a purchase of their interests by the London County Council, it is resolved:—'That, in the opinion of this Vestry, the operation of section 68 of the Water-Works Clauses Act of 1847 (whereby it is enacted that the charges for water shall be payable according to the annual value of the tenement supplied with water), and of similar provisions in the Acts of several Water Companies in the Metropolis, is attended with grievous injustice to the larger section of the consumers, and that the effect of the quinquennial revision of the valuation lists in the Metropolis under the Valuation Act of 1869, periodically possesses the Water Companies, at the expense of the consumers, of an enormous unearned increment, not contemplated by the Legislature when the Act of 1847 and the later Acts on the same lines were passed; and that this Vestry address a communication to the Local Government Board, suggesting that Her Majesty's Government should introduce a short Bill in the present session of Parliament to provide that when once the rateable value of a house or tenement has been assessed, the Water Companies in the Metropolis shall not be entitled to any higher rate of charge thereon, unless where an additional consumption of water follows the increase in the rateable value, and to provide also that the public shall be able to demand a supply by meter at a small quarterly minimum charge.'"

COMMUNICATED ARTICLES.

THE CONVEYANCE OF COAL AND OTHER SOLID MATERIALS IN GAS-WORKS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

It is an unfortunate circumstance, from a commercial point of view, that while liquids and gases can be readily and cheaply transferred from one part of the works to another, coal and other solid materials used in quantity can only be moved at some cost for labour. This is a point that cannot be too strongly pressed upon the attention of those engaged in the design or construction of gas-works. By far the greater part of the weekly wage-sheet is represented by the simple conveyance of material—coal wheeled into the retort-house, and coke wheeled out; coal put into the retorts and coke extracted therefrom; coke and breeze loaded into trucks, carts, or waggons; oxide or lime put into the purifiers, or taken out; the same materials moved about in the course of preparation or revivification. In short, if solids could only be moved about as readily and cheaply as liquids or gases, the cost of wages would be very moderate indeed; and this item would not be attracting so much attention as it does at the present time, when the workmen are devoting their energies to the question of less work and more money. What with increased price for coal, and higher rates for labour on the one hand, and the competition of oil and electricity, which render it very desirable that the selling price of gas should not be increased, on the other, gas engineers now find themselves very much in the position of being called upon to make the full tale of bricks without straw. While their working expenses are increased on the two most important items, they are called upon to make gas as cheaply as before. The result is, that, if possible, the attention directed to every item of gas-making expenditure will be still more increased, with a view of introducing economies and checking or preventing waste in every department.

Amongst other things, the subject of introducing machinery and motive power in gas-works, as a substitute for hand labour, is sure to come to the front. Already this has been practically applied in modern works to some extent. Its increasing importance is well known, and a notable feature in every large works constructed during the last ten years, let us say, has been not only a due attention to economy in conveying materials and the partial introduction of machinery, but a liberal provision for extension in this direction in the future. That its introduction has not already obtained to a much larger extent, is chiefly ascribable to the fact that the principal part of the gas-works plant at present in use does not lend itself readily to the adoption of mechanical labour-saving appliances. It is constructed on plans originally formulated and laid out some 25 years or more ago, at a time when anything besides ordinary hand labour was considered to be quite impracticable, except in the largest sized works. The majority of gas engineers, being untrammelled by any pressing necessity for the change, have rested contented with assumptions of this sort: If asked to adopt machinery, they would reply that they had no difficulty in selling gas at moderate rates, and earning full dividends. Their workmen were thoroughly reliable; and they anticipated no difficulty whatever in the way of keeping up a proper supply. Why then, they would ask, should we enter upon the worries and troubles inseparable from the use of complicated machinery, under the disadvantageous circumstances existing in retort-houses.

The experiences of the winter of 1889-90, come with a rude shock upon considerations of this sort, and scatter them to the winds. We need not enlarge upon difficulties that have been matters of current interest during the last few months, and the enormous increase of expenses that has been necessary to avoid—is it right to say "avoid," or merely "stave off"?—similar troubles in many cases. Many who have accepted the onus of paying higher rates of wages, or allowing shorter hours of work, had reason to hope that the concession would lead to greater care in working and improved results. Are these hopes likely to be realized? Apart from the purely pecuniary aspect, the obligations of gas companies in the matter of regular supply and pressure, and the inconvenience caused to almost every section of the public by failure in this respect, have lately been illustrated in a manner more pointed than agreeable. Any method of working which admits of greater security in supplying the demands of consumers, than when producers are entirely dependent upon the men, or as some would have it, upon the whims and caprices of a few individuals who call themselves the "representatives" of the men, will not be viewed from the standpoint of expense only. In some parts of the United States it is found desirable to keep an "iron stoker" ready for use, even if it cannot be worked except at considerable loss, as a protection to some extent against combination on the part of the workmen; and really the position of affairs in England appears to be drifting towards the necessity for a provision of this sort. So not only from motives of economy but also of expediency, may we expect that the applicability of machinery in our gas-works will be approached with redoubled energy, in the course of the ensuing season.

The history of mechanical stoking in this country is very instructive. The chief thing aimed at by the pioneers of this movement seems to have been rapidity of work, or how to extract the coke from the retorts, and introduce the fresh charge in the least possible time. Probably attention was attracted by the vast amount of flame and smoke seen to be escaping from the mouthpieces; and an exaggerated idea of the economy that would be secured by collecting the greater portion, at any rate, of the gas thus shown to be burning or escaping to waste, was the result. However that may be, this movement was begun at the wrong end. Instead of being introduced gradually and tentatively, as might be done by the use of simple and inexpensive appliances that aimed at doing one detail only—say lifting the scoop, for example—and could be readily put out of the way if not required, or out of order, we find that large, cumbrous, complicated, and costly machines, intended to do the whole thing throughout, were put forward. Questions such as simplicity of action, facility for repair, amount of capital sunk in the apparatus, and adaptability of the same to existing plant, were put entirely in the background. Gas engineers naturally hesitated before committing themselves to the adoption of costly machinery, requiring in some cases the construction of specially designed retort-houses, and settings of retorts. A mere glance at some of the machines was sufficient to prejudice anyone desirous of conducting his operations in a manner that would secure him reasonable freedom from anxiety. Should the apparatus fail in realizing the promises made for it by the makers—and such things do happen sometimes—the result would be simply disastrous. In referring to the expense of these machines, it is necessary to explain that they must be of the very best quality both as regards material and workmanship. Nothing less could be relied upon to stand the rough usage, the vibration, dust, and heat to which it would be subjected in the retort-house. The only direction in which it would be advisable to look for reduction of first cost would be that of simplicity in construction, as more likely to secure the introduction of the machine, even if it failed to carry out the whole of the retort-house routine. The great difficulty in the way of the introduction of charging and drawing machinery has been bulk and weight. It is not usual to construct the stage floors, where these are used, of such strength as to admit the traffic of a 20-ton machine. As regards bulk, many retort-houses have been constructed with no more width in front of the retorts than is sufficient for hand working. A machine must necessarily have two or three feet more. The rake and scoop must be capable of drawing back clear of the mouthpieces; and when projected to their full length in the retorts, a sufficient length must remain outside to allow of a firm grip. Then the machines were to some extent fixtures. They would only serve for a particular line of retorts, and therefore in works where the settings extended transversely across the breadth of the retort-house, or were otherwise divided out into separate sections, it frequently happened that in no case could there be found any one single line of frontage comprising a sufficient number of retorts to warrant the introduction of a machine. The breadth of some of the machines also, was such as to either demand a large space at each end of the line, to admit of clearance, or if that space was occupied by retorts, they had to be worked by hand. Many of these objections obtain to the present day; and they must be obviated before mechanical stoking can be introduced into medium or small sized works.

The earlier inventors also appear to have concentrated their attention on the actual charging and drawing, and to have disregarded the fact that the charging is merely the finishing touch, so to speak, or the last stage of a long journey taken by the coal, and that the drawing of the special charge is only the first stage of its conveyance either to the retort-house furnace, to the purchaser, or to the store heap. If any plan was proposed that increased the expense of handling the coal before it was introduced into the machine, or that of disposing of the coke, this plan was at once placed under the disadvantage of having very little margin for economy to work upon. In most of the schemes at present adopted in gas-works, this point receives proper consideration; and though the old terms of "stoking machinery," or "drawing and charging machines," are retained, some attempt is made in the way of a comprehensive system for receiving the coal directly from the truck or barge, and also for the removal of the coke.

This point is prominently illustrated in the report of a Committee appointed by the Bolton Corporation,* for the purpose of visiting different works where machinery was in use, and reporting on the economy of the same as compared with hand labour. The conclusion arrived at by this Committee was that a good system of coal breaking, elevating, and conveying was the most profitable direction in which to look for economy of hand labour; and they believed that the result of its introduction at one of their stations would be a saving of £750 per annum, equivalent to about 6d. per ton of coal carbonized. This estimate is based upon calculations made by Mr. W. Smith, Gas Engineer to the Corporation, the details of which are included in the report. They therefore proposed to put down a system of machinery for carrying out these operations at once, leaving the question of the actual drawing and charging for a future time. The advantage of a comprehensive system (including breaking, elevating, and conveying the coal) as compared with plain drawing and charging machinery, is also shown

* See JOURNAL, Vol. LI., p. 967.

by the results of some comparative trials conducted at the Rochdale Road station of the Manchester Corporation Gas-Works, under the auspices of the Gas Committee. The cost of wages per 1000 cubic feet of gas made was 3·01d. with the Foulis apparatus, and only 1·68d. with the West; and it was urged by the representatives of the former that a large portion of the extra expense shown on their system was due to the coal having to be broken and conveyed to the machinery by hand.*

The first view which one naturally takes of the subject of the introduction of machinery into gas-works, is that of its applicability to existing plant. There is, however, nothing to show that the system of horizontal retorts as generally used is the acme of perfection in carbonizing plant. They have been designed to suit hand labour, and no doubt are best suited for the purpose. But the possibility of effecting the work by machinery opens the door to the larger and broader question of improved carbonizing plant. The throwing off of the limitations necessary to meet the requirements of hand labour, leaves much more scope and liberty of action in the designing of retorts and furnaces; and it is necessary to ascertain whether the arrangements of apparatus that have proved by experience to be best fitted for hand working, are also the most suitable and economical for the application of machinery. Its introduction may be regarded as a step in the direction of continuous automatic carbonization, which is generally regarded as the goal to which gas engineers should direct their attention. This question, however, may well be left to the future. It does not come within the scope of the present paper, which is intended to deal only with the adoption of machinery in connection with existing forms of gas-making apparatus.

(To be continued.)

The Discovery of Coal in Kent.—At a meeting of the Manchester Geological Society, held last Tuesday, Professor Boyd-Dawkins read a short preliminary paper with reference to the recent discovery of coal near Dover, in which he stated that the coal measures had been struck at a depth of 1160 feet, and a seam of good blazing coal had been met with at a depth of 1180 feet. By this discovery the range of the coalfields of northern France and Belgium had been extended to this country, although the amount and value of the coal at that spot could only be ascertained by further experiment, which was now being taken in hand. It proved, however, that there was one coalfield at least at a depth under 1200 feet in south-eastern England; and this was well within the workable depth. In the discussion which followed, Mr. J. Dickinson, one of Her Majesty's Inspectors of Mines, said that, if the present surmises were true, they were justified in believing that the true coal measures had been penetrated near Dover; and he scarcely thought so cautious a scientific teacher as Professor Boyd-Dawkins would have led them to hope so much had he not himself felt satisfied that the true coal measures had been reached.

Gas and Electric Light Undertakings in Massachusetts.—In the JOURNAL a fortnight ago (p. 403), we gave a few particulars as to the position of gas and electric light undertakings in Massachusetts, as furnished by the last report of the Board of Gas and Electric Light Commissioners of that State. It was then remarked, in connection with the supply of water gas, that the Board have come to the conclusion that the license granted by them to the purveyors of this illuminant should not contain any certificate as to its safety, and that they should be empowered to insert such conditions as would tend to guard the community against accidents. They embodied in their report the draft of a Bill to carry out this idea; and the proposal has since been inquired into by a Committee of the Legislature. The Board consider that no company should be allowed to supply gas containing more than 10 per cent. of carbonic oxide, and that this limit should be specified in the license. The penalizing clause of their Bill has necessarily excited considerable opposition on the part of the various companies, who have called for its complete withdrawal. The Committee's investigations did not conclude till the 3rd inst.; so that our latest advices do not furnish any information as to the result. The Legislature is at present occupied with a large number of matters relating to gas and electric lighting; the most important probably being the question of the establishment of lighting plant by municipal authorities. This is a subject which is arousing much general interest; the so-called Nationalists, or State Socialists, having made it the first item in their programme. There are very few municipal lighting undertakings in America; and consequently the illustrations as to their working have to be drawn from England and Germany, but more especially from the former country. The principal arguments employed against the proposal to constitute public bodies suppliers of artificial light are that it is inexpedient in the existing condition of the American civil service, and that the cost of production would be greater than in the case of private adventures. But probably what has the most weight with the Legislature is the argument that gas-works in the hands of a public body would be made a part of the political machinery set to work in municipal elections—a course which is considered perfectly right and proper until the "other party" get in. This aspect of the question was dealt with in our editorial columns early in the year.

* See JOURNAL, Vol. XXXV., pp. 407, 439, 515.

ELECTRICITY IN BOSTON, U.S.A.

By an American Correspondent.

The subject of the development of light and power from electricity has lately received a great deal of attention in the City of Boston; the daily papers finding it a very prolific topic for reportorial articles, and for editorials as well. There are three reasons why the subject has thus come to the foreground at the present time. First, because of several large fires which it is generally believed have been caused by electric light. Secondly, by reason of the very rapid extension of electricity for the propulsion of street cars. Thirdly, on account of the contracts for lighting the streets with the arc lights now expiring; and the difficulty the city is in on this account. The truth is that electricity for light and power has, of late years, made very rapid progress in Boston. The public have been fascinated with the scheme of chaining and adapting to its own uses this powerful force of Nature, and has demanded its rapid extension. The result has been what the thoughtful man could easily foresee—that is, as the development of electricity was making such rapid strides, it was not possible to sufficiently surround it with those safeguards which we find curbing and keeping within bounds many of the other powerful forces of Nature, which are tamed and used for the convenience and pleasure of mankind. Consequently we soon find it leaping over such barriers as were erected around it, and marching on its destructive course.

The most serious result so far has been the fire which took place on last Thanksgiving Day—Nov. 27—which it is generally supposed was caused by a current of electricity running into the building over an electric time-wire from the wires of the electric railway. Other fires occuring soon after this, which though not of such magnitude, were nevertheless important in dollars and cents, led to a series of articles in the papers calling attention to the dangers, &c. Many of the papers which a short while since were most eulogistic in their praises of the electric light, were now among the first to throw stones at it. On the other hand it is refreshing to find some papers taking a calm view of the situation—stating frankly that electricity has come to stay, but also stating that means must be devised, and that promptly, to make it less dangerous to life and property. Many of the articles also bear the impress of having been written by some one more familiar with electric light matters than a newspaper reporter; and the fervour with which certain ideas are pressed upon the public attention, gives good ground for thinking that the advocate of some particular electric light system has taken advantage of the desire of the papers for information on electric light matters, and has buttonholed a reporter, giving him such information as would, if generally believed by the public, retroact to the benefit of the advocate's interests. This is regrettable. Still the discerning public are generally able to read between the lines, and so are not seriously misled.

One effect of all this newspaper discussion has been a demand for supervision of electricity by some competent body or board, appointed by the municipal or state authorities; the scheme being that such a party should have the general supervision of all electric wires, see that proper conductors are employed, that they are erected in a workman-like manner, and that in general they are surrounded by such safeguards as experience and forethought would suggest. This would certainly be a move in the right direction; for at present there are no restrictions imposed upon the companies save those which the insurance companies have instituted in regard to the running of wires inside buildings. True, to the credit of the Boston electric companies, it must be said that the desire to put up work in a proper way, and so that it would do injury to no one in person or property, has ever been present with them; but something more than this is needed.

In a city where there are so many miles of wire of all kinds, and designed for all sorts of uses, there is manifestly a need of some one controlling power, which could regulate the running of the wires of one company in their relations to those of another concern. Thus if we take the fire of Thanksgiving Day, the small wire of the electric time-service may have been run well enough, if we have regard only to the uses to which it should be put, and the same remark would hold true of the wires of the electric street railway. But the two wires came together, and direful are the results. Now, obviously, there should be some power which could require the time-service company to be extra careful in running their wires in the neighbourhood of other electric wires of high tension, or could insist that the electric railway should so protect their conductors that there would be the minimum of chance of other wires getting across their wires. Such safeguards have recently been erected in the form of guard wires, which protect the heavily charged wires of the railway. But this should have been done before. The fact that the door was closed after the horse had strayed goes to show the necessity of such supervision as I have suggested; for such a body would have (or should have) insisted that the electric wires of the railway should not be charged till all proper precaution had been adopted.

One of the Boston papers recently commenting on this phase of the subject says:

> Electricity is to be in the near future one of the greatest factors in our civilization, just as it has been and still is one of the greatest factors of Nature herself; and it were wiser that we set about to understand it better.

The electric current has two elements to be considered in this connection—volume or quantity estimated by amperes; and speed, pressure, or "potential" estimated by volts. It is the latter element that chiefly constitutes the danger to life. . . . A man may walk at ease through a slowly moving volume of water, even though it be the Mississippi; but a 2-inch stream from a fire-engine would carry him off his feet. This now familiar simile applies most aptly to electricity. A human being can stand an electric current of great volume if it be urged along its conductor at a low tension or speed; but if he receives a current of small or great volume sent along at a high tension or speed, he will receive a shock that will kill him in less time than it takes his nerves to inform the brain that something has happened. The difference in receiving a current of high tension and one of low tension and great volume, might be illustrated by comparing it to the difference of being struck by a bullet from a gun and a foot-ball thrown by hand. The smaller quantity coming at great speed will pierce the body; the great foot-ball, though larger in bulk, is impelled at less speed and would not cause injury. Hence in determining whether or not an electric current is dangerous, the first thing to do is to ascertain the tension at which it speeds along its conductor, rather than its volume. . . . All wires, whether insulated or not, whether continuous or alternating, should be considered dangerous to life when more than 1000 volts pressure are used. The fact that an electric power current of low tension proved fatal to a horse in Cambridge recently, seems to the uninformed as conclusive evidence that the same current would be equally or even more fatal to a human being. Now a horse is so sensitive to electricity as to be able to detect its presence when the delicate instruments for measuring its least appreciable quality will not fluctuate a hair's breadth. Why this should be so is not known; but the fact remains. The wire that figured in the Cambridge accident carried a current of less than 500 volts pressure, though of large volume. Such a current has never yet killed a human being to our knowledge. . . . It is necessary that the apparatus for the transmission of electrical power in this city should be put under the control or supervision of a competent person or department, who will have full power to enforce all the rules that may be devised for the protection of life and property from this new agent of force. But let us have no Board of Electrical Control like that of New York. It was the fault of this Board that caused the present panic (the reaction of which has now come) against the electrical power. It is difficult to suggest as to whom to give these powers. Electricians are in such demand that most of them have been retained by electric companies, and are wedded to one system or kind of electrical application, and are more or less prejudiced against other kinds. A commission of men, not strictly electricians, but men of honesty and practical intelligence, with a good general idea of the science of electricity, would seem to be the best sort to have charge of this question.

Opinions may differ as to the future of electricity; but we know that to-day it is in very extensive use. It is hardly likely that it will prove a seven days' wonder, which having flourished for a short time will cease to be; but rather that it will, in some of its forms, continue to minister to the wants of mankind. Hence we should welcome any scheme of supervision which would tend to make it less dangerous.

The other aspects of electricity in Boston will be considered in future articles.

Death of an Eminent American Civil Engineer.—The death is announced, at the age of 78, of Mr. W. J. M'Alpine, one of the most eminent civil engineers in the United States. Among the important schemes carried out under his supervision may be mentioned the Chicago Water-Works; and he was Consulting Engineer for the water-works at Toronto. Mr. M'Alpine was the first American to be elected a member of the Institution of Civil Engineers in 1867. He held the office of President of the American Society of Civil Engineers in 1868-9.

The East Greenwich Gas-Works' Men and their Engineer.—At the East Greenwich works of the South Metropolitan Gas Company last Saturday week, a handsome gold watch was presented by the workmen to Mr. J. Tysoe, the Engineer and Superintendent of that station, as a token of their "regard and esteem." Mr. Austin (the carpenter), who presided, said that this action of the men was not taken in consequence of what had been done at Vauxhall, but had been decided upon during the first week of the late strike, and had only been delayed in consequence of a deputation of workmen from the Old Kent Road works having asked East Greenwich to unite with them and the other stations in presenting a joint address to the Chairman and Directors of the Company. To this they consented; but after waiting several weeks, they found that the scheme of the chief station had fallen through. They therefore determined to carry out their original plan—viz., to present the Chairman and Directors with an address, and their Superintendent with some suitable token of their feelings towards him. A report of the collection was then read by the Honorary Secretary of the Testimonial Fund, who said the task of obtaining the necessary money had been a very easy one, as there was scarcely a man or boy on the works who had not contributed his part; and the whole sum was in hand in a few hours. The presentation was then made by Mr. Stradling (the coal jetty foreman). Mr. Tysoe, who was received by the men with hearty cheers, remarked that, when leaving home that morning, he little thought he was about to receive such a handsome gift. On his arrival, he was asked by the foreman (Mr. Elbourn) to meet the men at one o'clock. He inquired if it was anything important; and, being told that it was, promised to be there. He found that it was both important and pleasant. He should value their gift highly for its intrinsic worth, but far more highly as a proof of the good feeling existing between the workmen and himself; and while thanking them for their kindness, he assured them it would always give him great pleasure to do anything he could that might add to their happiness and well-being. The draft of an address to the Directors was then submitted to, and approved of, by the men; and the proceedings terminated with cheers for the Superintendent and foremen.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Thirteenth Annual Meeting.

As already briefly recorded in the JOURNAL (*ante*, p. 332), the Thirteenth Annual Meeting of the above Association was held on the 20th ult., at the Great Western Hotel, Birmingham—Mr. H. PEATY (of Burslem), the President, in the chair.

The HON. SECRETARY (Mr. J. S. Reeves, of Bilston) read the minutes of the previous meeting; and they were confirmed.

THE ANNUAL REPORT.

The annual report of the Committee (given in the JOURNAL for the 25th ult.), and the statement of accounts, were then presented; and, on the motion of Mr. J. ANNAN, of Wolverhampton, they were adopted.

ASSOCIATION REPORTS.

It was next resolved that the volume of "Reports of Gas Associations" for the past year should be supplied to all the members free.

NEW MEMBER.

The PRESIDENT proposed that Mr. Edward Jones, Manager of the Ellesmere (Salop) Gas-Works, should be elected a member of the Association.

Mr. P. SIMPSON (Rugby) seconded the motion, and it was carried unanimously.

REPORTING THE MEETINGS OF THE ASSOCIATION.

The PRESIDENT next read a letter from a representative of the press, asking to be allowed to attend the various meetings of the Association.

After some discussion, it was resolved that the present arrangement of the Association providing its own reporter be continued.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered his Inaugural Address, which has already appeared (*ante*, p. 332).

Mr. C. TAYLOR (Derby) proposed a vote of thanks to the President for his very able, useful, and suggestive address. He remarked that the members had known Mr. Peaty so long, and had had so much admiration for him generally, that they were not surprised to receive from him suggestions which they would take away with them and turn to valuable account.

Mr. P. SIMPSON, in seconding the motion, expressed his pleasure at having Mr. Peaty in the chair; and said that, judging from what they had heard that day, he would do honour to the Association.

The motion was carried with applause.

The PRESIDENT, in acknowledging the vote, thanked the members for the attention they had paid during the reading of his address. He said he had not done all he should have wished on the different points referred to; but he had gone as far as he could. It was difficult to introduce anything fresh or interesting; and he took the way in which the members had received his address as an augury that they would have a pleasant year, and that he should have their co-operation in working for the good of the Association and of the gas industry generally.

CHANCE'S SULPHUR-RECOVERY PROCESS.

Mr. CHARLES MEIKLEJOHN (Oldbury) next read the paper on the above subject, which will be found in another part of the JOURNAL to-day.

On the conclusion of the reading of the paper, which was warmly applauded,

The PRESIDENT expressed the indebtedness of the members to Mr. Meiklejohn for his very valuable contribution to the proceedings of the Association. Now that sulphur was being more and more fixed in the lime processes of gas manufacture, it would, he said, be very interesting to know whether this could be recovered in some way. He believed Mr. Valon stated that 20 per cent. of sulphur was fixed in the oxygen process; while in the address delivered by Mr. T. May to the Southern District Association of Gas Managers the previous week, it was stated that by using air in the purification of gas, he was able to get as much as 12 per cent. of sulphur fixed in the lime. If they could get this sulphur back in a marketable form, it would be very desirable. He thought the paper would give them thoughts which would enable them to accomplish this in some way or other. He moved that a hearty vote of thanks be given to Mr. Meiklejohn for his interesting communication.

Mr. H. TAPLAY (Stoke-upon-Trent) seconded the motion. He said he thought the formulæ placed before the members were too much for them to deal with then; and therefore he suggested that the discussion of the paper should be taken at the next meeting, after they had had time to consider it.

The PRESIDENT agreed that it would be altogether better to defer the discussion, as the members were not familiar with the formulæ presented to them.

Mr. CHARLES HUNT (Birmingham) approved of the adjournment of the discussion, to afford the members an opportunity of mastering the intricate details which had been laid before them.

It was then agreed that the discussion should be taken at the next meeting.

The business then closed; and the members afterwards dined together.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

The Half-Yearly Meeting of this Association was held last Tuesday, at New Swindon. The members received a hospitable welcome from the Directors of the New Swindon Gas Company, and commenced the day's programme by inspecting the gas-works, under the guidance of the President (Mr. J. J. Jervis), who is the Engineer and Secretary of the Company.

Visit to the Company's Tar-Works.

In the course of the morning a visit was paid to the tar-works belonging to the Company; conveyances being provided for the purpose. Here the party had an opportunity of inspecting two tar-stills, each capable of dealing with 1000 gallons, together with the necessary condensers and accessories for the manufacture of crude naphtha, light oil, anthracene oil, and pitch. The crude naphtha is rectified, yielding 50 to 60 per cent. of once-run naphtha, boiling at 120° C. The light oils are treated with soda, and subsequently with oil of vitriol; and thus made to yield crude carbolic acid. The anthracene oil is allowed to stand till the anthracene settles out; and the clear liquid is sold for use in gas-works as an exhauster lubricant, and also for brick tables. Some part of this product is converted into cart grease by adding rosin oil, and disposed of in that form. The anthracene is prepared for the market by compression in a hydraulic press; and the pitch is either sold as such, or else used for the manufacture of briquettes.

Words of Welcome.

At noon, the business meeting was held in the Board-room at the works. The President occupied the chair. After the usual preliminary business, Mr. A. G. While, one of the Directors of the New Swindon Gas Company, addressed the members, saying that it was a great pleasure to welcome the Association to Swindon on this their second visit, and especially during Mr. Jervis's year of presidency. Gas companies had certainly had much to struggle through in the last few months, in the way of increased prices of coal and demands of the workmen; but he hoped they would be as prosperous in the future as they had been in the past. As to the electric light, that had not injured gas companies in the least, but rather the other way, as it had put them on their mettle, and encouraged them to push their business in every possible way. It had also had the effect of extending the demand for artificial light; and the gas companies had secured a share of this increased business. Mr. Chandler, the Chairman of the Old Swindon Gas Company, also welcomed the members. He said he could recollect the time when gas was first introduced, and superseded oil; and he hoped he should live to see the time when electric light would supersede gas—because he believed that would secure him a long "innings." (Laughter.) Though it might undoubtedly be used as an accessory to gas, he agreed with Mr. While that it would be a long time before gas was superseeded.

Place of the Next Meeting.

The President having invited suggestions as to the next place of meeting, Mr. D. Irving, of Bristol, proposed that it should be held at Bristol. Mr. H. Sainsbury, of Trowbridge, seconded the proposition, and it was carried unanimously.

The Inaugural Address.

The President, in the course of his address, referred to the state of the coal markets. Looking at the probable increased cost, and the difficulties in the way of advancing the price of gas on the one hand or reducing dividends on the other, he thought that any expedient for augmenting the yield of gas per ton—such as the Dinsmore process—was now of special interest; and he suggested the advisability of the appointment of a member by the Association, for the purpose of personally getting the fullest possible information on this or similar processes, and reporting at the next meeting. Speaking after some years' experience in the working up of tar, he thought it was equally important for a gas company to take up this department as to manufacture sulphate. In regard to the question of increasing the sale of gas per ton, attention was directed to the possibility of improvements in connection with main and service laying, the use of prepayment meters, and the fitting up of artizans' dwellings. The President said he had lately introduced the system of presenting the gas accounts monthly, instead of quarterly, taking the meter indices at the beginning of each month, and allowing a discount of 10 per cent. for payment within a fortnight. This offered the advantages of a readier discovery of defective meters and leakages, of keeping the collection of accounts much closer up, and reducing the loss by bad debts. Regarding the labour question, his experience was not in favour of bonuses, profit-sharing schemes, or payment by results; and he could see no better plan than the old fashioned one of payment by the "turn." Nor did he find eight-hour shifts to be better than the twelve-hour system. After alluding to West's stoking machinery, some models of which were on the table, the President spoke of the use of a small percentage of air as a means of assisting the work of the purifiers. During the past few months he had introduced about 2 per cent. at the inlet of the exhauster, using an oiled-silk valve similar to an air-pump valve, as a safeguard against loss by back pressure. Being about to erect a 100 feet single-lift gasholder, he found from tenders actually received that the adoption of Pease's wire-rope system would afford a saving of 20 per cent. on the cost of the holder and 15 per cent. on that of the tank. The system was explained to the meeting by the aid of a working model.

A vote of thanks was passed to the President for his interesting address, on the motion of Mr. J. H. Cornish, of Bridgwater, seconded by Mr. A. V. Daniel, of Portishead.

West's Stoking Machinery.

After acknowledging the vote of thanks, the President invited Mr. John West, of Manchester, to explain the models of his drawing and charging machinery that were on the table. Mr. West proceeded to do so. In reply to questions, he said that the charger was 2 inches smaller than the retort all round, and that, when carbon had so far accumulated as to interfere with the machine, it was quite time it was cut off. An increased make was the usual result of introducing these machines. At the Maidstone Gas-Works, where there were fourteen through beds of six retorts each, they produce 10,900 cubic feet of gas per ton; and at the Portsea Gas-Works, above 11,000 cubic feet. The cost of the machinery at Maidstone was £1500 to £2000; and for single beds, it would be one-half this sum. It was questionable if it could with advantage be introduced in works as small as 15 millions; but it paid well at Westgate, where the make was less than 20 millions. He had applied it to all sorts of retort-houses.

The President proposed a vote of thanks to Mr. West for his kindness in attending the meeting and sending the models. This was carried with applause; and Mr. West briefly replied.

Mr. Dexter's Paper.

A paper entitled "A Method of Increasing the Consumption of Gas for Cooking and Heating Purposes," was then read by Mr. F. G. Dexter, of Wantage. It comprised an account of a scheme introduced in the town by the author in the course of last summer. On taking over the management of the Wantage Gas-Works about eighteen months ago, Mr. Dexter found many difficulties to contend with, some of which were due to the fact that several different tradesmen had been employed from time to time to lay the mains and services. As soon as possible, he secured permission from the Corporation, who are owners of the gas-works, to carry out several improvements, embodying (1) additions to the staff for stoking and yard work, (2) the engagement of a thorough mechanic and fitter, (3) power to hold an exhibition of cooking, heating, and lighting apparatus in the Town Hall during the following summer, (4) full license to hold the necessary stock and store of apparatus and fittings, and to let gas-stoves on hire, (5) to undertake all kinds of gas-fitting work, and (6) to sell gas for lighting and working purposes (excepting the use of boiler burners only) at a reduced price of 3s. 4d. instead of the regular price of 4s. 2d. per 1000 cubic feet. The exhibition was accordingly held last June. It was of the usual character, extending over four days, and including lectures on plain and high-class cookery. Admission was by invitation ticket only. Mr. Dexter insisted on the importance of dealing in materials and workmanship of first-class character. For this reason, he refused to supply other than open bottom globes, or governor burners; and, in this connection, remarked on the absurdity of continuing to supply, with every bracket or pendant, a brass gallery suitable for the old pattern of narrow-bottomed globe only. As these "galleries" are now useless in nine cases out of ten, he thought the attention of manufacturers might well be directed to the matter. The result of the exhibition was very satisfactory; and the fitter had been fully employed—indeed, had been making one-quarter overtime—ever since. At the close of the exhibition, some 25 stoves were on order; and at the present time, upwards of 60 had been fixed. This, it must be remembered, was in a small town, comprising only about 200 consumers, and 4000 to 5000 inhabitants. The profit on the fitting work had not only sufficed to pay the extra wages, but also main and service laying, meter fitting, tool and general repairs, &c. He only let cooking-stoves on hire at rents ranging from 1s. to 3s. 3d. per quarter, but supplied all kinds of stoves, bath heaters, &c., at cost price. In fixing apparatus, he charged cost price, or even less, for apparatus affecting day consumption; but in all other cases allowed an ordinary profit. The whole of this department received his own personal supervision; and he had been able to please and satisfy his customers. Mr. Dexter next dealt at some length with the policy of allowing large discount—20 per cent. in his case—for gas used for heating and cooking. He believed that this was decidedly necessary in slow-going, old-fashioned towns (where the price of gas was high, at any rate), in order to secure any decided increase of day consumption. Gas for such purposes was supplied at practically no cost whatever for distribution; the same main, service, and meter that supplied the evening consumption being used. The loss by leakage remained the same, unless the pressure was augmented. The question of how to determine the day, as distinct from the night consumption, had to be met. He rejected double-index meters, or separate meters and services for the stoves, as costly, and likely to lead to complication and annoyance in working; and he found it better to take the year's consumption previous to the fixing of the stove as a basis for the lighting consumption—supplying all gas consumed above that quantity at the reduced rate. This plan was useful as encouraging a more liberal use of gas for lighting purposes, and also as

discouraging any reduction in the consumption. In the case of new consumers, duplicate meters were sometimes used; but in many cases, he had been able to arrive at a satisfactory agreement. The result of the introduction of this plan was that the consumption for the Michaelmas quarter of last year showed an increase of 30 per cent. For the following quarter, when the consumption for lighting was larger, the increase was 15 per cent. This advance was still well maintained.

In the course of the discussion, Mr. A. V. Daniel, of Portishead, said that some years ago he had introduced a somewhat similar plan to that described by Mr. Dexter, and with equally satisfactory results. The method of dividing the heating from the lighting consumption might not appear quite parliamentary; but it certainly answered well in small towns. Mr. H. Sainsbury, of Trowbridge, said he let stoves on hire, and laid the supply-pipe from the meter free of cost. He had let out about 100 stoves, and charged nothing for fixing, only the rent of the stove. He had an exhibition some years ago; and it produced a brisk demand for stoves for a time, but several customers subsequently returned them; so that, on the whole, the number of stoves did not increase much. Gas-stoves in high-class houses did not appear to take well; and it was with the middle and better class of artizans that the stoves were most successful. He thought the differential system of prices would not suit in his district. Mr. John West, of Manchester, on being invited to speak by the President, said that no doubt Mr. Dexter's plan would answer well in places like Wantage. The fact that gas-stoves were not used more freely in the past was greatly due to the laxity of gas managers; and he remembered going to a gas-works 36 years ago where they were making stoves, letting on hire, and selling just as many were beginning to do now. That works had the largest day consumption that he ever knew of. By educating the consumers, the use of gas-stoves could be greatly advanced. He could scarcely agree with the idea of gas companies doing all their own fittings, for there were some good gas-fitters about; nor did he think it was wise to keep to one make of stove or burner. It was a good thing to get day consumption; but he did not know about a large reduction in price. If properly advocated, gas would stand on its own merits. In reply, Mr. Dexter said it was his rule to supply everything up to the meter free of charge. Mr. West had rather misunderstood him with regard to his using one sort of burner. He kept to burners with governors—not to any one make. It was only for small works such as his own that he suggested keeping to one make of stove. Mr. J. H. Lyon, of Cosham, who was prevented by illness from attending, sent a communication saying he had applied a system similar to that adopted by Mr. Dexter at some small works which he held on lease, and with satisfactory results.

Controlling a Gasholder at a Distance.

The President next invited discussion on the question of managing a gasholder at a distance of a mile and a half from the gas-works, without a special trunk main; the said holder giving a pressure greater than it was desired to put upon the ordinary distributing system. He proposed to connect the holder to the nearest gas-main with a 10-inch pipe, to have a governor with the usual bye-pass for distributing the gas, and to fix an exhauster on the bye-pass, so that gas could be drawn in from the main to fill the holder. Mr. S. W. Durkin, of Southampton, thought the plan would not be so good as a separate main. Mr. D. Irving, of Bristol, said there was a great deal of risk about the idea mentioned by the President. The stopping the exhauster when the holder was full, involved a great responsibility on the man in charge; and there would be a risk of unsteadiness in the mains. He would prefer to use a separate main, and to "drive" not "draw" the gas. Mr. E. J. Lloyd, of Bristol, knew a case where the crown of the supplying holder was drawn completely in through working the exhauster after the holder was empty. Mr. John West said he had worked a plan similar to that suggested, and thought that a separate main was imperative. He had even known the pulsations of the exhauster to drive the water out of the consumers' meters. He never felt happy about the plan, but still it was at work to this day. After estimating the cost of the exhauster, &c., and the working expenses, he believed the President would find it cheaper, as well as better, to lay a new main. Mr. W. Davis, of Poole, considered that, while the safest plan was an independent main, if Mr. Jervis chose to try the experiment, it need not be a costly one. To overcome the difficulty due to pulsation of the exhauster, a small holder might be used (say) of only 100 cubic feet capacity for the exhauster to draw from.

Votes of Thanks.

Mr. Sainsbury, of Trowbridge, proposed a vote of thanks to all who had contributed to the proceedings that day, either by reading papers, speaking in the discussions, or showing models. This was seconded by Mr. J. H. Gray, of Weston-super-Mare, and carried unanimously. Mr. T. Hardick, of Salisbury, referred to the kindness of the New Swindon Directors in entertaining them, and proposed a vote of thanks to them. This was seconded by Mr. E. C. Riley, of the Great Western Railway Company's gas department, and carried with applause. Mr. W. H. Ludgate, Chairman of the Company, having replied, the President moved a vote of thanks to Mr. Dean, the Engineer of the Great Western Railway works, for allowing the Association to visit the works. Mr. W. H. Brinkworth, of Chippenham, seconded the motion; and it was cordially passed.

The Great Western Railway Works.

The party then proceeded to visit the G.W.R. works, where they were divided into small groups, each under the care of a guide. At the private gas-works they had an opportunity of inspecting a new gasholder and concrete tank. The gasholder comprises two lifts, each 33 feet high by 106 feet and 104 feet in diameter respectively; and when fully inflated it will contain 500,000 cubic feet of gas. The usual guide-framing for the top lift has been dispensed with; the columns extending only a few feet over the height occupied by the lower lift, after the plan followed by Mr. George Livesey. The roof of the holder is untrussed. A little experimental works attracted a good deal of attention, and some samples of compressed oil gas and coal gas were to be seen; also the new duplex and triple burners, lately introduced into the carriages of this Company. The walk through the extensive premises was necessarily hurried. Passing through the steam-hammer shop, the visitors came to the wheel-shop, where they inspected the operation of heating the tires of wheels by means of atmospheric gas-burners supplied with air under pressure, before "shrinking" them on in their places. The rolling mills, where plate and bar iron were being rolled, the hydraulic-engine house and accumulators, the boiler shop in which riveting by hydraulic power, and the heating of the rivets by means of gas, was being conducted, and a 20-ton hydraulic crane used in connection with the boiler and girder work, were next inspected. The brass and iron foundries, with core furnaces heated by gas, the brass finishing shops, also claimed attention; and lastly the saw mills and carriage departments. Some idea of the magnitude of the works may be gathered from the fact that they at present afford employment for more than 7000 hands, and that the weekly pay-roll exceeds £8000.

The proceedings concluded with a dinner at the Rifleman's Hotel, which was followed by the usual congratulatory toasts.

New England Association of Gas Engineers.—From the accounts which have reached us of the proceedings at the twentieth annual meeting of this Association, which was held in Boston (U.S.A.) on the 19th and 20th ult., under the presidency of Mr. Taber, it was one of the most successful which has been held since the formation of the society. Mr. Taber proved to be an efficient President; and the papers read were quite equal to expectations. Unfortunately, the Secretary (Mr. C. H. Nettleton) was unable to be present, having been called into the West; but his duties were undertaken by Mr. C. J. R. Humphreys. Mr. C. F. Pritchard, of Lynn (Mass.), is the President for the current year; the Vice-Presidents being Messrs. H. A. Allyn and W. A. Wood. Mr. Nettleton continues in his office as Secretary. We shall commence next week our usual notice of the proceedings, abstracted from the "Official Report" in the *American Gaslight Journal*.

The Cost of Municipal Electric Lighting in Paris.—A report has lately been presented to the Paris Municipality on the cost of the electric light in certain of the installations belonging to the city authorities. Taking first the Hotel de Ville, we find that the plant comprises 4000 10-candle and 500 16-candle incandescent lamps (used on occasion of fêtes); the machinery for their service consisting of two Edison dynamos of 110 volts and 200 ampères, and five Gramme dynamos of 110 volts, three of which are of 250 ampères and two of 500 ampères. The cost per lamp-hour of 16 candles is 8·4c., and per Carcel hour, 5c. As from July last year the Place du Carrousal has been lighted by electric lamps served from the Edison station in the Palais Royal. In this case the cost per lamp-hour (about 30 Carcels) is 63c. The Parc Monceau—the beautiful park in the north-west quarter of the city—is lighted by 20 Jablochkoff lamps, at a cost of 48c. per lamp-hour and 2·4c. per Carcel-hour. In the Buttes Chaumont—the park on the north-east side of the city—there are 46 Brush lamps, each of 40-Carcel power; and in addition, 16 incandescent lamps of 16-candle power each, are employed for lighting the restaurant. The cost of this installation is 1c. per Carcel-hour. As already stated in the Journal (*ante*, p. 432), an important high and low tension installation has been completed at the Central Markets; but no accurate statistics are available in respect to it. It is estimated that the cost, including all expenses except rent, will be 5c. or 6c. per 100 watt-hours. Our readers are aware that during the period of the Exhibition the principal boulevards were lighted by electricity. This work was carried out by the Popp, Edison, and Rothschild-Deprez Companies. The following were the expenses of this extensive installation:—Popp Company, 40 lamps, of 75 Carcels (10 ampères), 1fr. 5c. per lamp-hour. Edison Company, 37 lamps of 75 Carcels (40 ampères), 82c. per lamp-hour. Rothschild-Deprez Company, 27 lamps of 75 Carcels (10 ampères), 82c. per lamp-hour. It may be interesting in this matter to compare these figures with those given in the number of the Journal for November 19 last year (p. 964) respecting the improved gas lighting carried out by the Paris Gas Company, which, as stated in our columns last week, excited the admiration of Mr. Edison during his visit to the city. The entire amount spent by the Municipality on electric lighting has been 782,750 frs., of which 100,000 frs. has been devoted to experiments.

THE RECOVERY OF SULPHUR FROM ALKALI WASTE.

A Paper read by Mr. C. Meiklejohn at the Meeting of the Midland Association of Gas Managers, Feb. 20.

How much the world is indebted to the science of chemistry could scarcely be more graphically portrayed than by a historical account of the residues of the various manufactures formerly thrown on one side as "waste," but now worked up and utilized. In some cases they form the basis of the manufacturer's prosperity, while the original object of manufacture may have become a secondary matter so far as value is concerned; and in others, new manufactures have developed solely out of the "waste products" from works still carrying on the original processes. Thus we have the manufacture of paraffin candles from the refuse heaps of shale-oil works; the manufacture of creosote, anthracene, carbolic acid, benzol, naphtha, disinfecting powder, and the beautiful aniline dyes, from the tar and the various salts of ammonia from the liquor of gas-works; while in the alkali-works we have a good illustration in the fact that it has been the increasing value of hydrochloric acid alone which has enabled alkali makers by the Leblanc process to compete at all with the cheaper ammonia-soda process in the manufacture of soda-ash or carbonate of soda; and, finally, in the beautiful process for the "recovery of sulphur from the vat-waste," which I have the honour to bring before you, we have the complete triumph of the chemist over unprofitable residuals and fast-accumulating waste. Thus the ills of life have been decreased, and its comforts increased, by the new substances brought to light by the chemist (as by the touch of a magician's wand), affording bread to the increasing number of honest toilers, and means of gratifying the taste for the beautiful inherent more or less in all men.

Before dealing with the alkali waste, it may be interesting to trace how this waste arises; and to briefly refer to efforts made in the past for the recovery of the sulphur therein contained. Previous to the year 1793, the whole of the carbonate of soda of commerce was obtained from the burning of seaweed or "kelp," collected from the north-west shores of Ireland, Scotland, and France; from barrilla, from the burning of the salsola soda plant, cultivated on the coasts of Spain; and from Egypt and Hungary, as a native carbonate of soda. The manufacture of carbonate of soda as a chemical industry was one of the consequences of the French Revolution. The ordinary supplies being cut off, the manufactures of soap and glass began to languish; and the Government of the day issued an invitation to the French chemists to aid in utilizing all the materials deposited in their own country by Nature, "so as to render vain the efforts and hatred of despots." A Commission was appointed to investigate the subject; and in 1794 they reported on thirteen processes which had been submitted to them for the manufacture of soda-ash, or carbonate of soda, from common salt—preference being given to that of an apothecary named Leblanc, who had works then carrying on the processes constituting his invention. These processes were fully described in the report, and were as follows:—(1) The salt-cake process, or the decomposition of common salt by sulphuric acid, and the production of sulphate of soda or salt-cake, with the evolution of hydrochloric acid gas. (2) The black-ash process, or the decomposition of salt-cake by means of chalk and coal; the black ash resulting consisting essentially of soluble carbonate of soda (Na_2CO_3) and insoluble calcium sulphide (CaS). (3) The separation of the constituents of the black ash by lixiviation with water, and the preparation of soluble carbonate of soda.

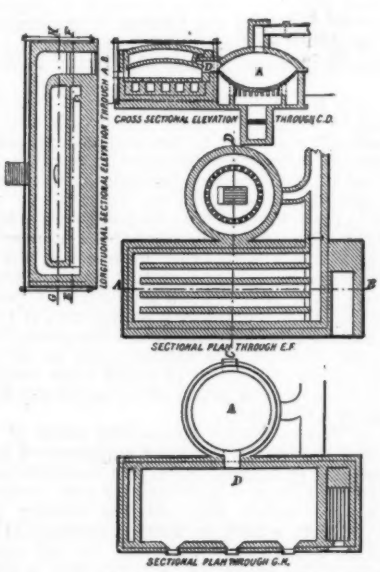
Strange to say, this method elaborated by Leblanc before the French Revolution, continued to be that employed by alkali makers universally till 1861, when Solvay placed the ammonia-soda process (invented in 1838 by Messrs. Dyer and Hemming, and first carried out practically in 1855) on a satisfactory basis; but the great bulk of alkali makers still keep to the Leblanc process—the increasing value of hydrochloric acid, and now the complete recovery of the sulphur hitherto lost, enabling them to compete successfully with the newer process, and the cheaper one so far as soda-ash manufacture is concerned. With this fact in mind, it is sad to have to relate that Leblanc never benefited by his inventions; for the war following the Revolution depriving him of funds, his works had to be suspended. Later he applied to, and obtained assistance from, the English Government; but finally this man, who thus originated a world-wide industry, and to whom we owe cheap soap and cheap glass, died in a French hospital for paupers. It is curious to note how history repeats itself, so far as the unprofitableness of invention is concerned, in a modern and successful method of recovering the sulphur from the "vat-waste" which neither benefited the inventor nor reimbursed the firm who spent thousands of pounds in carrying it to a successful issue!

I have prepared sections of a salt-cake furnace, and of a black-ash (hand) furnace; hoping that my reference to the Leblanc processes might thereby be the more readily followed.

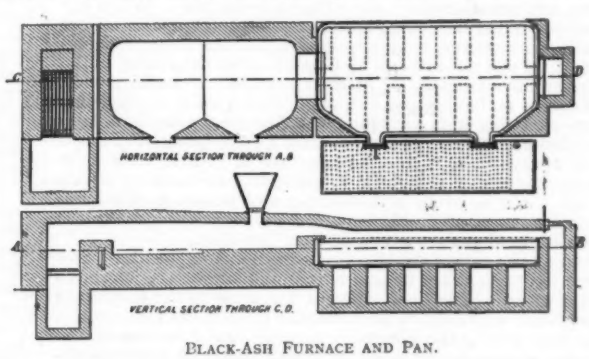
The Salt-Cake Process.—As stated in the summary of Leblanc's first process, it is as common salt that sodium first enters on its wondrous course in an alkali-works. A charge of about 16 cwt. of salt is placed in the iron pan shown at A, and upon this is run enough (123·5 gallons) sulphuric acid (1·42 sp. gr.) to decompose the salt. Dense volumes of hydrochloric acid vapour are given off, which escape by the earthenware pipe leading from the cover of the pan, and are recovered in condensing towers constructed of stone flags, the joints being made tight by a cord of vulcanized india-rubber. The condensing-towers are filled with coke or other inert material, down and through which water trickles. The escaping gases, quite free from hydrochloric acid, are led to the chimney; while the liquor, running from the condensers, consists of a highly concentrated solution of the acid. The chemical change which takes place in the pan is simply the driving off of the weaker hydrochloric acid by the more energetic sulphuric acid, which combines with the sodium of the salt to form sulphate of soda, or salt-cake, as represented by the following equation:—

$$2\,NaCl + H_2SO_4 = Na_2SO_4 + 2\,HCl.$$

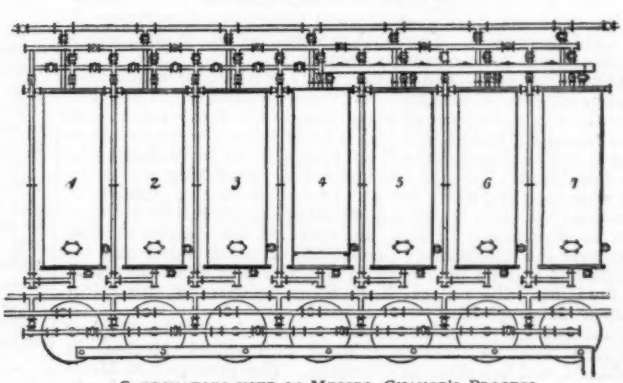
The reaction is not completed, however, in the pan; part of the salt only being converted, and some not at all. As soon as the hydrochloric acid ceases to be given off in quantity (about one hour), the charge is transferred, by means of a paddle, through the opening D to the muffle furnace, the outlet



SALT-CAKE FURNACE AND PAN.



BLACK-ASH FURNACE AND PAN.



CARBONATORS USED IN MESSRS. CHANCE'S PROCESS.

from which also leads by earthenware pipes to the condensers. Here the salt, and the partially converted sulphate, re-act on each other, more hydrochloric acid is given off, and the whole of the salt is converted into sulphate of soda, thus—

$$NaCl + NaHSO_4 = Na_2SO_4 + HCl.$$

The time required to complete the reaction here is one hour. [The author then explained the muffle furnace, and referred to the improvements effected in the salt-cake furnace since Leblanc's time; concluding with a description of the muffle, *plus* pressure in flues, the waste heat utilized to heat the air supply, and Root's blower and regenerator for recovering waste heat.] So far there is no waste, as we have the whole of the sodium combined with the whole of the sulphuric acid, and the chlorine is entirely recovered in the condensers as hydrochloric acid. The salt-cake is raked from the furnace as a yellowish white powder, and wheeled away to the black-ash furnace.

Black-Ash Process.—This furnace, in the old form I have shown, for the sake of simplicity, is simply an open-hearth or reverberatory furnace over which the flames travel, escaping at the opposite end to the chimney. The salt-cake, limestone broken fine, and ground coal are mixed in the following proportions (hand furnace):—Salt-cake, 100 parts; limestone, 100 parts; coal, 70 parts. This mixture (about 4¾ cwt.) is charged into the furnace. It is kept constantly stirred; and in about two hours the whole is fluxed and fully decomposed. The following equation represents the chemical change which takes place:—

$$Na_2SO_4 + CaCO_3 + 4\,C = Na_2CO_3 + CaS + 4\,CO.$$

Thus the sodium of the salt-cake has combined with the carbonic acid of the lime to form carbonate of soda, which is soluble in water; while the lime has combined with the sulphur of the salt-cake to form insoluble sulphide of lime (CaS)—the coal having disappeared as carbonic oxide gas, the heat of which in burning, together with the waste heat of the furnace, is utilized in evaporating down a solution of carbonate of soda from a former charge. The liquid mass is scraped into iron barrows to cool, and in this state is known as "black-ash ball," so called from the colour of the mass. The modern black-ash furnace and that now generally adopted consists of a revolving cylinder 8 to 10 feet in diameter, and from 15 to 18 feet long. This is driven slowly at first, when freshly charged with about four tons of the mixture already given, by a small engine fixed at one end, something after the fashion of a "Standard" washer; the maximum velocity being about six revolutions per minute. The axle of the cylinder is hollow, and through this passes the gas from a Siemens gas-furnace; then through a brick chamber in which are placed the pans for the evaporation of the soda solution; while below the revolver are the regenerators for the recovery of the waste heat.

This brings us to the third process described by Leblanc—viz., the lixiviation of the black-ash by water. This consists in the breaking up of the black-ash ball, and placing it in a series of tanks or vats. A stream of water enters the first tank, and passes through the series; leaving the last as a concentrated solution of carbonate of soda. This solution is further concentrated in the pans over, or heated by the gases from, the black-ash furnace; and as the crystals separate out, they are raked from the pan, and transferred to a reverberatory furnace. When the roasting operation here is complete, we have the brown ash or soda-ash of commerce, so largely used in the manufacture of glass and soap. I will not attempt to follow further the course of the sodium in the manufacture of soda crystals or washing soda (bicarbonate, or baking powder, and caustic soda) beyond just stating—and this it is very important indeed for us to note in connection with sulphur recovery—that a great quantity of burnt lime is always used in the manufacture of caustic soda or in the manufacture of bleaching powder, one or both of which is or are made in every alkali-works; and hence, as the limestone can be most profitably burnt on the works, large volumes of carbonic acid gas are available from the kilns.

When all the carbonate of soda is dissolved out by the water and run off, there is left behind in the tank or vat the insoluble sulphide of lime (CaS), consisting of the whole of the sulphur of the sulphuric acid used in the salt-cake process, and the whole of the lime used in the black-ash process, and constituting the vat-waste, accumulating in mountainous heaps at every alkali-works, and forming an invariable and gloomy accompaniment of the Leblanc process. The amount of sulphur which is thus lost is estimated at 100,000 tons per annum.

Sulphur Recovery.—The discovery of a method by which this sulphur could be economically recovered in marketable form, has been the aim and object of alkali makers for many years; but until recently it has proved "a veritable will-o'-the-wisp—luring men to serious discomfiture, if not to ruin." So far back as 1837, the late Mr. W. Gossage commenced a painstaking research; but after spending thirty years and a fortune on the problem, it remained unsolved. In his paper read before the British Association at Manchester in 1861, he said: "I am convinced that whenever the utilization of the sulphur in alkali waste may be effected, it will be by means of the action of carbonic acid." In the light of the process I am about to describe, this utterance seems prophetic.

Amongst the prominent names connected with this sulphur recovery may be mentioned Mond in England, Mactear in Scotland, and Schaffner in Germany. The processes of Mond and Mactear have only a limited application; that of Mond only recovering about 40 per cent. of the sulphur, while Mactear's process only recovers the sulphur in the liquor drained from alkali waste heaps. Messrs. Chance Bros., of Oldbury, took in hand the process of Schaffner and Helbig, and in two years, with an expenditure of about £10,000 in elaborating and improving the method on a working scale, established the process as successful in recovering the whole of the sulphur in the vat-waste, as sulphuretted hydrogen, which they proved could be made into acid at a cost equivalent to 3d. per unit of sulphur in Spanish pyrites. The pyrites companies were at this time charging the alkali makers 6d. per unit of sulphur; so that there seemed every prospect that the process would become universally adopted. In the last of a series of four papers on this process by Mr. A. M. Chance, F.C.S., the following words occur:—"A reduction of 3d. per unit in the price of pyrites would, as has been shown, deter alkali makers from embarking in it in its present form." There was great uncertainty amongst alkali makers as to the course the pyrites companies would follow. But in the autumn of that same year, the price of pyrites was reduced to 3d. per unit; and this effectually stopped the adoption of this process of sulphur recovery. The whole alkali trade thus benefited by the reduction forced on the pyrites companies by the success of this process, which had cost Messrs. Chance Bros. two years of hard work and so much money to perfect. This was in 1883. Nothing daunted, the same firm, having, unlike poor Leblanc, the sinews of war at command, continued investigating this so far unprofitable problem, until, on March 5, 1888, after five years' additional work and an expenditure of a few more thousands of pounds, in Mr. Chance's paper read before the Society of Chemical Industry in London we have revealed one of the most valuable contributions to applied chemistry of recent years, in the description of a process whereby the sulphur is not only recovered and accounted for to the extent of 95 per cent. present in the vat-waste, but at a cost which will make the process profitable even if the pyrites companies undertake to supply pyrites for nothing.* In this paper by Mr. Chance (to whom I desire to express my extreme indebtedness for his great courtesy in furnishing me with a copy, for kindly supplying me with the samples on the table to illustrate my paper, and also for the privilege of seeing the whole process from beginning to end), I find the following statement:—"What Mr. Gossage in 1837 and subsequent years believed would be done, and tried hard to do at his Stoke works, near Bromsgrove, we accomplished in 1887—just fifty years later—at Oldbury, both in the county of Worcester; and the conviction which he expressed in 1861 has now been realized. By means of lime-kiln gases, Mr. Gossage sought to effect the recovery of sulphur from alkali waste; and it is by means of lime-kiln gases alone that we have succeeded."

Of course, every gas manager is aware, in view of the publication of the paper by the late Mr. R. H. Patterson, one of the London Gas Referees, on the purification of gas from sulphur other than sulphuretted hydrogen by means of calcium sulphide (CaS), that carbonic acid combines with the lime to form carbonate of lime, driving forward the sulphur as sulphuretted hydrogen; and I think Mr. Patterson's claim was for the elimination of carbonic acid and the formation of calcium sulphide in the purifiers. Now this action of carbonic acid on calcium sulphide was what Mr. Gossage conclusively proved; and it was well understood by alkali makers. But the irregular strength of the sulphuretted hydrogen given off, rendered it unfit for use by any known process. On April 18, 1883, Mr. Chance, referring to sulphuretted hydrogen said: "Eventually it will be treated for obtaining free sulphur by one of several methods which are now being investigated at Oldbury, or by some method which may be hereafter introduced."

Such, then, was the position and history of the sulphur-recovery process in 1883, when (again quoting Mr. Chance) "a ray of light suddenly appeared to me, and encouraged me to persevere;" this ray being the publication on April 29, 1883, of the patent of Mr. C. F. Claus for obtaining sulphur from sulphide of hydrogen—in other words, the Claus kiln for recovering the sulphur in the solid form from the sulphuretted hydrogen escaping from the saturator of the sulphate of ammonia plant. In July, 1883, Mr. Chance, with other members of the Society of Chemical Industry, visited one of the works of the South Metropolitan Gas Company, and saw the kiln in experimental operation. Simple as the problem now appears, it took four years of work, and, as I have already said, a few more thousands of pounds of expenditure, before sulphur, such as the samples before you, the quality and purity of which have satisfied the most critical consumers, was produced economically from vat-waste by means of a Claus kiln.

The Process of Messrs. Chance Bros.—The secret of Messrs. Chance's success consists in obtaining sulphuretted hydrogen gas of constant and practically unvarying composition. This is accomplished as follows:—The tank or vat waste is first run over a screen, which sifts out the coarser portions, unburnt coke, &c., into a tank, in which a mechanical agitator thoroughly mixes the waste with water to the consistency of a thin cream. This cream is then run into a tank, from which it is pumped to the carbonators, a series of seven cylinders, 6 feet in diameter and 15 feet long, fixed vertically.

* An article on the process here referred to appeared in the JOURNAL, Vol. LI., p. 680.—ED. J. G. L.

The pipes and valves of these carbonators are so arranged that, beginning with any one in the series, the rest can be worked through in rotation, while one or more can be shut off at will. When charged with "cream of waste" to the extent of 9 feet of their height, a powerful carbonic acid pump is set in motion, drawing the gases from the lime-kiln and forcing them through the carbonators at a pressure of about 40 lbs. to the square inch; the chemical action taking place being the absorption of the carbonic acid by the lime, forming carbonate of lime, while the sulphur is liberated as sulphuretted hydrogen, and escapes by a pipe on the top of the cylinder—

$$CaS + CO_2 + H_2O = CaCO_3 + H_2S.$$

The stumbling block at this point had hitherto been the dilution of the sulphuretted hydrogen by the inert nitrogen, which forms 70 per cent. of the lime-kiln gases, and the varying strength of the sulphuretted hydrogen. Now, it was found that when the carbonic acid gas was sent through several cylinders in succession, the sulphuretted hydrogen given off in the first was absorbed in the second, and so on; and while this process of absorption of the sulphuretted hydrogen by the alkali waste was going on, nothing but inert nitrogen, with a trace of sulphuretted hydrogen, was escaping from the last vessel in the series. Hence, by allowing this inert nitrogen to escape, a stronger compound of sulphur and lime was formed, which, when decomposed by the carbonic acid, yielded two equivalents of sulphuretted hydrogen instead of one, thus—

$$CO_2 + CaH_2S_2 + H_2O = CaCO_3 + 2\ H_2S$$

Calcium sulphydrate having been formed by the absorption of the sulphuretted hydrogen by the alkali waste. The constancy in the composition of the sulphuretted hydrogen gas is simply obtained by the method of rotation adopted in working the carbonators.

This at first sight seems a difficult and complicated operation; but, in reality, it is simple and easily controlled. After the inert gas has escaped, and the sulphuretted hydrogen gas from one of the intermediate cylinders is of the strength required, it is turned on to the holder, and is shut off when it shows signs of weakness. Two cylinders are now emptied and re-charged, the carbonic acid is again sent through the series, and the inert nitrogen allowed to escape through an oxide of iron purifier, to absorb the trace of sulphuretted hydrogen. When the intermediate cylinder shows the sulphuretted hydrogen strong enough, it is opened to the holder; and when showing signs of weakness, it is shut off. From this it will be seen that the supply of sulphuretted hydrogen is intermittent. By having two series at work, so that when inert gases are escaping from one, strong sulphuretted hydrogen is escaping from the other, a constant supply of strong sulphuretted hydrogen is obtained; but whether the supply is constant or not, the composition is, as the following analysis taken from Mr. Chance's paper will show:

Date.	9.0 A.M.		4.30 P.M.	
1888.	Per ct. H_2S.	Per ct. CO_2.	Per ct. H_2S.	Per ct. CO_2.
Feb. 8 . .	33·4	1·6	34·0	2·0
,, 9 .	32·3	1·7	33·0	2·0
,, 10 .	34·0	1·0		1·6
,, 11 .	34·0	2·0	4·0	2·0

Having now obtained the sulphuretted hydrogen of constant composition, it remains for me to describe the two methods adopted for recovering the sulphur in marketable form. By the first method, the gas is burnt in a specially constructed kiln forming sulphur dioxide, which is led over the nitre pots into lead chambers for the manufacture of sulphuric acid, in which case the chamber acid is as clear as water, and of great purity—being quite free from arsenic. The sulphur accounted for by this process amounts to from 98 to 99 per cent. of that present in the gas; and the sulphur returns in the original form in which it was used in the salt-cake process, but of greater purity.

In the second method, the sulphur is recovered in the solid form by means of a Claus kiln. This consists of an iron cylinder 25 feet in diameter and 9 feet deep, lined with fire-bricks, and having a tray or sieve of perforated quarries about 3 feet from the bottom, on which are laid a layer of broken bricks about 2 feet deep, and a layer of dry peroxide of iron about 1 foot deep. The sulphuretted hydrogen is forced through the kiln with a fixed and definite proportion of air; both the gas and air being measured through large station meters. The gas and air enter at the top of the cylinder, and pass downwards through the oxide of iron. The chemical reaction is so great that not only is the sulphuretted hydrogen split up (the hydrogen combining with the oxygen of the air to form water), but the sulphur is sent forward in the state of vapour. The great importance of a constant composition in the sulphuretted hydrogen gas is here strikingly illustrated, because if oxygen is in excess of the quantity required to combine with the hydrogen of the gas, sulphur dioxide is formed, and escapes; or if the supply of oxygen is deficient, a loss of sulphuretted hydrogen is the result. But when the percentage composition of the gas is known, then the air supply can be correctly adjusted and maintained. Part of the vapour of sulphur condenses in the kiln itself, and runs down channels made in the fire-clay lining of the floor, into an iron pan, as molten sulphur; and from this it is run into moulds. A part, however, passes on in the state of vapour and is condensed in large brick chambers having baffle walls built across, to divert the current and promote condensation. Here the remainder of the sulphur is recovered in the solid form; the chambers when just opened presenting a scene of great beauty. Where the vapour current strikes the first wall, it is just as if a dashing torrent had been emerging from the wall midway between the floor and the roof, and had been instantaneously frozen into pure sulphur. Along the surface of the hard, almost crystalline rock sulphur, which covers the floor of the first chamber to the depth of from 3 to 5 feet, there appears a miniature forest of yellow stalagmites, from 1 to 3 feet in height, and of various forms and thicknesses; while, on the walls around, the sulphur had deposited in quite a distinct form, resembling in shape a flattened pear. So regularly were they ranged in rows—the points of the upper row being concealed by the heads of the lower row—that I was tempted to think they had been placed in position by hand. As the last division of the chamber is reached, the sulphur is found in the state of fine yellow powder; and by reducing the temperature at which the kiln is worked, the whole of the sulphur passing from the pan as vapour may be recovered in this form, which is about twice as valuable as the rock sulphur, and, is, in fact, the "flowers of sulphur" known in every household. In practice, and depending, of course, upon the orders in hand, two kilns and two sets of chambers are kept at work—the one producing "flowers," while the other produces what may be a less valuable form of sulphur, but one which presents, on the opening of the chambers, a scene of indescribable beauty. By this process not only is the sulphur from the vat-waste fully recovered, but it is done by means of a noxious and injurious gas, which otherwise would add its quota to the impurity of the atmosphere. It must be borne in mind that from the beginning of the process to the end it is conducted in closed vessels; and the smell of sulphuretted hydrogen is nowhere discernible.

In the paper read by Mr. Chance before the Society of Chemical Industry, he suggested that even the carbonate of lime run from the carbonators might be utilized either in the black-ash process or in making cement. The latter has now been proved a success, and you have before you a bottle of the cement being manufactured in the neighbourhood, and a sample also of a briquette made from it. I have also seen a wall faced with this cement equal, or superior, to any Portland cement facing I have come across. Thus the whole of the materials used in the various processes of Leblanc are now recovered in marketable form.

Is it too much to hope, after this, that a time may come when by the further advances of science, and a more intimate knowledge of the facts of every-day experience, a fogless London will be a reality, and the "black country" a term which only reminds us of the barbarous past; when vegetation will flourish, even up to the gates of a chemical works; and when pure air will be as available for the toilers in our towns as for the peer in his castle? The utilization of waste will do much to bring about that time when,

> "By experience taught, the mind shall learn
> That not to know at large of things remote from use,
> Obscure and subtle, but to know that which before us lies
> In daily life, is the prime wisdom."

Societe Technique du Gaz en France.—The forthcoming congress of this Society is to be held at Lyons on the 17th of June next and following days, under the presidency of M. Le Treust. At the close of the business, the members will have an excursion into Switzerland, and visit the Lake of Geneva.

Death of Mr. E. E. Phillips, of High Wycombe.—We regret to record the death, on the 7th inst., at the early age of 40, of Mr. Edward Ernest Phillips, Engineer and Secretary of the High Wycombe Gas Company. Mr. Phillips enjoyed good health until about three years ago, when he was attacked by a serious internal ailment which necessitated his temporary retirement from active work. Although he happily recovered to a certain extent, he was subject at intervals to painful relapses; and during the past three or four months these attacks increased in severity. Towards the close of the week before last unfavourable symptoms manifested themselves; and to these he succumbed. Mr. Phillips was a native of Luton; his father (the late Mr. W. Phillips) being Engineer of the gas-works there. On completing his education, Mr. Edward Phillips took a position in the works, and acquired there a thorough knowledge of the business. In 1872, when only 22 years of age, he was appointed Engineer and Manager of the High Wycombe Gas Company; and the Directors had every reason to congratulate themselves on their choice. He subsequently became Manager of the gas-works at Beaconsfield and Princes Risborough. In 1875, he became Engineer to the High Wycombe Water-Works Company. This undertaking had till then been in great difficulties; but Mr. Phillips succeeded in transforming it into a valuable property. Though busily engaged in the special occupations which constituted his life-work, his energies were by no means exhausted by them. He manifested a lively interest in all that concerned the welfare of the town and district in which he had taken up his abode. The great respect in which he was held was testified by the large representative attendance (including the workmen of the Gas Company) at the funeral, as well as by the sympathetic demeanour of the townspeople generally. The deceased gentleman, who was brother of Mr. A. F. Phillips of St. Albans, leaves a widow and four children.

REGISTER OF PATENTS.

Manufacture of Gas for Illuminating and Heating Purposes.—Dinsmore, J. H. R., of Liverpool. No. 5145; March 26, 1889. [1s. 6d.]

In view of the inquiries now being made as to the "Dinsmore Process," the specification of this patent is of special interest; containing, as it does, twelve sheets of drawings showing various modifications of the apparatus used for the introduction of the tar into, and the complete gasification of it in, the retorts.

In one arrangement, the patentee proposes to lead the gas from the retorts into (say) the hydraulic main, and thence to the front end of the "duct" or chamber; passing the gas through the duct and leading it out by an upright passage (also heated) through the roof of the bench having on its end a vertical artificially-cooled passage. At the vertical exit passage the tar is introduced; and the tar gas resulting from the heat of the duct combines with the coal gas, and passes out with it. In this way the gas before arriving at the "zone of tar distillation" becomes heated, and combines with the hot tar gas or vapours. Also the heat of the duct at the point where the tar is introduced is not subjected to the cooling influences of the coal gas entering it; the two functions of heating up the gas and distilling the tar being practically carried on in different parts of the duct. The arrangement also provides simple means for converting existing benches of retorts so as to be worked according to this invention; being applicable to both single and through benches of retorts and ducts.

According to a modification of the arrangement, the gas and tar may both be introduced into the duct through the vertical passage towards or at the rear or middle of the duct (accordingly as the duct may be single or through), and led out by an artificially-cooled passage disposed on the mouth of the duct, and from thence to the main.

In some cases it is proposed to employ a number of heated ducts or chambers in a bench, and lead the gas from the other benches to these ducts; introducing the tar into the ducts or chambers in the presence of the gas. The outlets of these ducts are provided with artificially-cooled passages arranged as already described; and the tar and gas may be introduced, treated, and caused to travel also in the same way. This combination provides means for using one or more of the existing benches as tar-distilling benches; the existing coal-distilling benches remaining unaltered. In such an arrangement, separate pipes from those parts of the hydraulic mains fed by the different retorts and benches constituting a group, would have to be provided with pipes leading to the heated ducts adapted to be used in connection with them.

In cases where it is not desirable to introduce the tar by allowing it to fall under a small head directly into the duct or chamber from a point above it, it can be injected by pressure due either to gravity or artificial means; and its injection may be made in a solid stream or in a comminuted or pulverized state. If it is injected in a solid stream or led to the duct by a pipe, the pipe or device must be kept cool by artificial means—*i.e.* by causing cold water to pass over or in connection with it, and thereby prevent its choking up from the heat. In lieu of cooling the pipe, an artificially-cooled chamber may be adapted to shield it from the radiant or conducted heat of the duct or chamber.

In combination with the tar, the patentee proposes to introduce carburetted hydrogen, water gas, or other suitable hydrogenated gas, by and with which the gases resulting from the distillation of the tar are taken up and become mixed, blended, and rendered permanent. Whatever gas or combination of gases is used, it may be employed under pressure to pulverize the tar—when the mode of pulverizing it is employed; and if it is in a cool state when introduced, it may also serve to keep cool the pipe or device by which the tar is delivered to the duct or chamber. One mode of pulverizing the tar consists in causing the gas under pressure to issue in an annular jet around the tar pipe or nozzle. Another consists in causing the tar to drop on to a jet of gas, and thereby become broken up and pulverized.

One main method of making gas from tar according to this invention is therefore, in pulverizing the tar; then heating it in a duct or chamber; and then cooling it by passing it through a cooling duct or passage at the outlet of the duct. The ducts may be arranged in any suitable way, and the tar or tar and gas introduced, and the gas emitted, in any of the ways or at any points already specified. When, however, tar is introduced under pressure or pulverized, it may be conveniently introduced at the mouth, and the resulting gases let out at the back through the artificially-cooled passage; or else through the roof as already described. Or by providing a pipe or a partition or division plate in the duct or chamber, the tar may be introduced at the mouth of the duct, and the tar or other gases thereby caused to pass to the end of the retort, and then return and pass out by an artificially-cooled passage at the mouth of the duct.

According to a modified mode of distilling the tar and converting it into permanent illuminating gas, the inventor suggests the introduction of it into the duct or chamber by, and pulverizing it with superheated steam; the resulting gases being passed through the heated duct, and subsequently cooled upon leaving it. He, however, prefers to employ the above described mode of operation and gases to effect its pulverization; and if steam is used, to first pass it through incandescent carbonaceous material, whereby the oxygen becomes fixed by a portion of the carbon, and carbonic oxide is formed—the hydrogen being thereby fixed. That is to say, he prefers to use water gas in some suitable form; the carbonic acid being inert in the presence of the tar vapours. In cases where the fluid used to pulverize tar is warm or hot, he prefers to introduce the tar separate from the pulverizing fluid, in order to avoid choking as above mentioned; but at the same time, by artificially cooling the passages, they may be introduced together by the same device.

In the manufacture of coal gas according to a further modification of this invention, the gas after leaving the coal-distilling retorts is gradually rid of its aqueous vapours and tarry matters to a considerable extent, by causing it to pass through a cooling set of pipes, and preferably in a continuous stream. After the aqueous vapours and other moisture and tarry matters are thus more or less removed and the gas comparatively dry, it is introduced into the duct or chamber; the tar being also introduced, as above described, at the same time. Both are subjected to the heat of the duct; and the tar, being thereby distilled, combines with the coal gas—the two becoming a blended permanent gas. By this process the heat of the duct is not so much absorbed in raising the temperature of the gas; and the result is said to be an increased illuminating power and generally better result.

Starting Gas-Engines.—Partridge, M., and Brutton, R. H., of Yeovil. No. 6261; April 10, 1889. [8d.]

This invention relates to apparatus for starting gas-engines, but is applicable to starting any machines where it is necessary to revolve the main shaft before the power employed to drive the engine or machine becomes fully effective. One method employed is to key or otherwise fix on the main or crank shaft of the engine, a ratchet wheel mounted in bearings in a driving lever (so as to run freely therein), and fitted with a pawl or driver, which, when the lever is raised, falls into gear with the teeth of the ratchet-wheel and drives it and consequently the main shaft. Then, when the engine is effectually started, the lever is allowed to drop, the pawl or driver falls out of gear with the ratchet-wheel, and the latter revolves with the main shaft without affecting, or being affected by, the driving lever.

Refractory Balls or Lumps for Incandescent Gas-Fires.—Main, R. B., and A. P., and Darwin, H., of Glasgow. No. 6325; April 13, 1889. [4d.]

This invention has for its object to provide for use in gas-fires refractory balls or lumps of such a nature as to readily become incandescent on being heated by a gas-flame, and by the use of which "a very close approximation to the appearance of a coal fire is obtained." In the production of the balls or lumps natural sponge is used as a base; or in lieu of sponge any light fibrous material having absorbent properties may be substituted. This base is saturated or soaked in a slurry composed mainly of clay, carbon, and silicate of soda. After drying, by means of warm air, the material is carbonized or baked in a furnace; and upon removal it is ready for use in gas-fires as a substitute for the asbestos or fire-clay balls or lumps commonly employed. The slurry in which the spongy base is immersed may be composed of the ingredients just mentioned in various proportions; but it is preferred that it should be made by mixing the materials in warm water in the following proportions:—2 lbs. of china clay; 1½ lbs. powdered carbonaceous or carbonized material; ½ lb. silicate of soda—to which a small proportion of sugar or gummy matter may be added.

Gas-Stoves for Heating and Cooking.—Clarke, T. E., of Dunster, Somerset. No. 6445; April 15, 1889. [8d.]

This invention has for its object "the utmost utilization of the heat produced by the gas-flame, and the prevention of waste by the premature escape of the heat up the flue."

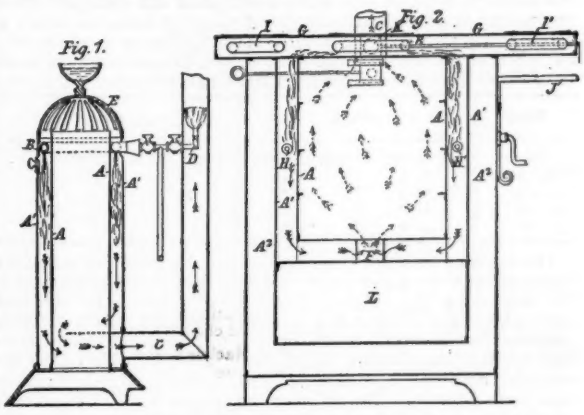


Fig. 1 is a sectional elevation of the heating-stove; and fig. 2, a sectional front view of the cooking-stove.

The heating-stove consists of a pair of concentric metal cylinders A A^1, forming between them an annular chamber closed at the bottom. Near the top of the chamber is a ring-burner B, with downwardly projecting jets. The bottom of the chamber is furnished with a flue C, which leads to the open air, or to a chimney. Thus, when the stove is lighted and a draught created in the flue, the gas-flame and the products of combustion are drawn down the full length of the stove before escaping; and by this means "an extended heating surface for the surrounding air is provided." The draught in the flue may be obtained, if desired, by means of a burner D, provided with a separate stopcock. E is a cover for the stove, preferably pierced or slotted to permit of the passage of a heated column of air within the cylinder A.

In the cooking-stove (fig. 2) the principle of action is precisely similar. The stove is of sheet iron, and consists, in lieu of a pair of concentric cylinders, of a square box A within a rectangular casing. This box forms an oven; and the outer casing A^1 the heating space around it—the oven being provided in front with a door (not shown). A^2 is an air space, to prevent the radiation of the heat. G is a chamber forming the stove top, and in which the burners are situated. C is the flue inserted in the back of the casing; the space between the back of the oven A and the back plate of the casing A being divided off to form a separate chamber, the only entrance to which is at F, beneath the oven. Thus, the flame from the burner B must pass down the sides and beneath the oven before reaching the back, and escaping to the flue. H H^1 are a pair of burners situated on either side of the oven, to be lighted when the heating of the lower portion only of the oven is required. I I^1 are two burners situated in the stove top, over which are placed loose covers, which can be removed when required, and replaced by a cooking utensil. The burner B has also a similar loose

cover. The burner I[1] is preferably a burner with the gas-jets beneath, like the burner B; and it is situated in a projecting part of the stove top, so that the heat therefrom may be utilized for grilling and toasting, by placing the food to be cooked underneath upon an adjustable bracket or tray J. There is a ventilator in the back of the oven operated from the outside by a rod. The draught in the flue, on starting the stove, may be created by opening the damper K, and thereby temporarily making a direct communication between the chamber in the top of the stove and the flue; or a separate gas-flame in the flue may be temporarily lighted, as in the heating-stove. The space L, beneath the oven, may be used as a "hot plate."

APPLICATIONS FOR LETTERS PATENT.

3332.—SYKES, B. C., and BLAMIRES, G., "Improvements in separating hydrogen gas and the light carburets of hydrogen, such as methane, from water gas or producer gas, or from both of them when mixed together." March 3.

3376.—DAVY, W., "Improvements in gas or lamp chimneys or glasses." March 3.

3453.—GORDON, T., "Improvements in gas-lamps." March 4.

3490.—SHAW, J., "An improved construction of reflector lamp for gas-lights, and also an improved cover for globes surrounding gas-lights." March 5.

3491.—FAIRWEATHER, W., "Improved apparatus for preventing damage through pressure to water-supply pipes in dwelling or other houses." A communication from I. H. Flesch. March 5.

3582.—SIEMENS, F., "Improvements in hot-air gas-lamps." March 6.

3684.—HOLGATE, T., "Improvements in the method of and apparatus employed in the manufacture of coal gas and of compounds of ammonia." March 8.

3726.—HORN, W. W., "An improved gas-burner." A communication from A. G. Morey. March 8.

The Belfast Corporation and Electric Lighting.—The Belfast Corporation, at a special meeting last Wednesday, passed a resolution approving of an application being made on their behalf to the Board of Trade for a Provisional Order to authorize them to supply electricity within the city. In the course of the discussion, the Mayor (Mr. C. C. Connor) remarked that the lighting of the city had been well done by the Corporation during the gas period; and he hoped if the electric lighting period was coming on, they would be able "to combine both, so as to avoid any loss to the ratepayers."

Increase in the Price of Gas at Burslem.—The Burslem Town Council have agreed to a proposal to raise the price of gas by 3d. per 1000 cubic feet. The reasons which the Chairman of the Gas Committee advanced in justification of this step were that the price of coal on the contract which is about to expire is, through the miners' advances, 60 or 70 per cent. less than the prices now ruling in the market, and there is a possibility of a further increase; also that they will find it necessary in a short time to spend large sums on plant, &c., without having anything laid by for replacement or depreciation.

Gas Consumers' Liabilities on a Change of Tenancy.—At the Westminster County Court last Thursday, before Mr. F. Bayley, an action was brought by The Gaslight and Coke Company against a Mr. Smith to recover £3 7s. 5d. for gas supplied. The plaintiffs' solicitor produced the agreement signed by the defendant, and called two witnesses to give evidence as to quantity of gas registered by the meter. The defendant's wife was called, and denied that they had consumed the gas for which they were charged. The fact was that they let their house to a Mr. Heaton, who, when he took possession, promised to give the necessary notice to the Company. Instead of doing this, he continued to burn the gas. His Honour remarked that, although Mr. Heaton had deceived them, they were none the less liable, as they had never given the Company notice to discontinue the supply. He gave a verdict for the Company for the amount claimed.

The Proposed Electric Lighting of Hackney Workhouse.—In the JOURNAL for the 4th ult. (p. 201), we referred to the project which was then before the Hackney Guardians for introducing electric lighting in the new workhouse buildings at Homerton, which are now approaching completion. The consent of the Local Government Board was obtained to the carrying out of the scheme, at an estimated initial cost of £920, and an annual charge of £75 for working expenses, exclusive of the salary of an electrical engineer. Tenders for the work were obtained from some 28 firms; and the Building Committee recommended the acceptance of one submitted by a local firm, for £1110. At the last meeting of the Board, the matter came up for consideration; and an amendment was brought forward to accept the tender of a firm who have for some time had in hand the lighting of a suburban town north of London, and whose figure was £60 lower. A long discussion took place, with the result that a further amendment, effectually quashing the whole proposal, was carried by 10 votes to 8.

The Northern Coal Trade.—During the last few days the coal trade has been unequal and irregular. This is usually the dull season in the year, because the Baltic trade has not opened out, and the house coal and gas coal trades fall off; but the uncertainty as to the working of Midland collieries made many users of coal desire to stock. Northumbrian steam coal has been dull, but is now rather firmer; and the price—which fell to as low as 12s. per ton for best coal, free on board—has risen to 12s. 6d., while gas coal is also slightly firmer. In this branch of the trade, the chief producers ask about 13s. per ton, free on board; and there seems to be a fair shipment in progress. But the local demand decreases daily; and the chief gas companies do not use much more than two-thirds of the coal they carbonized six weeks ago. Household coal has been depressed by the recent mild weather; but the crisis in the Yorkshire coal trade has given more orders for coal for the South, and it is probable that there will be a fair trade. The coke manufacturers are scarcely so well employed as they have lately been; and the prices are decidedly weaker for blast-furnace coke. Gas coke is firm—most of the production having been sold forward at advanced prices; and there have been some shipments of moment.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by correspondents.]

The Gas Institute and their late Secretary.

SIR,—Referring to your editorial remarks in the last JOURNAL, I cannot help thinking that any censure for discourtesy shown to the late Secretary rests more with the new organization than with the old.

The present Council of The Gas Institute, as a Council, had nothing to do with the unfortunate misunderstanding that arose between the late Secretary and the then remnant of what once was a Council. The false position occupied by him during the latter part of his term of office, was in my opinion due entirely to the precipitate resignations of the majority of the members of the then Council, and who are now forming the Council and nucleus of the proposed new Institution. Had they remained at their posts, and maintained their trust until the next general meeting, and then retired, suitable expression could consistently have been given to the feelings of the members present. Any such expression, however, under the circumstances of the last June meeting, would have been open (and rightly) to the charge of insincerity; and it would have appeared to many as very much like adding insult to injury.

When a new organization was first talked of, it was thought by some that one of its strongest claims to existence was the opportunity it might afford of placing the late Secretary in a similar position to the one he had been compelled to vacate by the wholesale resignations of the then members of the Council of The Gas Institute. Why then did not the Council of the new Institution at its first meeting make some sign? They made no advance, by resolution or otherwise, to express their feelings to the late Secretary of The Gas Institute; although, in my opinion, he was a victim to the policy they pursued. Want of sympathy and shabby treatment, therefore, if there be such, does not rest with The Gas Institute.

Ramsgate, March 15, 1890. WILLIAM A. VALON.

Lymm Local Board Gas-Works.—At their last meeting, the Lymm Local Board resolved to extend their gas-purifying plant, at an estimated cost of £470.

The Proposed Royal Commission on the Salford Gas Frauds.—At a meeting yesterday week of the Committee for promoting the ratepayers' petition praying for the appointment of a Royal Commission to inquire into the Salford gas frauds, the following resolution was passed—"That in view of the resolution passed by the Salford Corporation on Wednesday last, this Committee is of opinion that the petition promoted by the ratepayers should not be presented until the termination of the forthcoming Leeds Assizes, and the hearing of the action against Mr. Lever at those Assizes." It was, however, also unanimously decided that whatever might occur in respect of the action against Mr. Lever at the Assizes at Leeds, even were there no hearing at all, the petition should be presented within the current month.

Increase in the Price of Gas at Mossley.—The Gas Committee of the Mossley Corporation decided last Thursday to increase the price of gas 4d. per 1000 cubic feet; making the rate 3s. per 1000 in the borough and 3s. 2d. outside. At the meeting of the Town Council at which the matter came up for confirmation, the Mayor (Mr. Alderman R. S. Buckley), who is Chairman of the Gas Committee, explained that it was expected that the increased price of coal, the advance in the wages of the stokers and the yardmen, and the probable diminution in the product per ton of coal would cause a loss of £1670. Three-fourths of this amount was represented by the increased price of coal, and the other fourth by the greater cost at the works. By raising the price of gas 4d. per 1000 cubic feet, they would produce £1080. They hoped to save £250 in the amount of coke used at the works, and to get an additional £283 by the increased price of coke sold. Tar had advanced in price, and they expected to get £177 more from this source; also £200 as profit from the manufacture of sulphate of ammonia. These items amounted to £1990; and if their expectations were realized, they would at the end of the year be £320 to the good. The Committee would increase the amount of profit if they could; and he did not think there ought to be any grumbling at the advance in the price of gas. The resolution was confirmed.

The Salford Strike and the Gas Profits.—At the meetings of the Finance Committees for the Pendleton and Broughton districts of the borough of Salford held last week, reference was made to the diminution in the gas profits. At the Broughton Committee a claim was made for improved lighting in the district; but the matter was put off because the contribution from the gas profits would only amount to £2000 this year, instead of the £8000 which was expected. The Pendleton Committee had anticipated receiving £5000; but the Borough Treasurer explained that the Committee had found that they would only be able to distribute £11,500 this year, and the amount due to that district would be only £2800. In order to provide this £11,500, the Committee had undertaken, if necessary, to only set aside 1 per cent., instead of 3 per cent., for depreciation, and not to depreciate hired meters. There might, however, probably be a larger surplus than £11,500 raised; and in this case the Committee would receive more than the £2800. Mr. Roper stated that the Gas Committee intended to go into the question of whether it would be advisable to pay right off, or extend over a number of years, the expenses incidental to the recent strike. The Pendleton Committee, however, were sure of receiving £2800. Alderman M'Kerrow said that what actually took place at the meeting of the Committee was this: The Chairman said the expense of the recent strike had been £20,000. The sum of £21,000 out of the profits was divided between the districts last year; and this was, as nearly as possible, the difference between last year's and this year's profits. In round numbers, it might be stated that the Committee were £21,000 worse off than last year, so that nothing could be distributed out of the profits. It was therefore decided to reduce the depreciation fund in order to provide £11,500. The additional expenditure of £20,000 was not entirely due to the strike; there was the increase in the wages of the workmen and an advance in the price of coal.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Thursday, March 13.

The Newcastle and Gateshead Water Bill and the Ystrad Gas and Water Bill were referred to a Select Committee, consisting of Earl Bathurst (Chairman), Earl Romney, Lord Saltersford, Lord Seaton, and Lord Wimborne; to meet on Tuesday, March 18.

During the past week the following progress was made:—
Bill read a second time: Falmouth Gas Bill.
Bill reported: Baildon Local Board Bill.
Opposition withdrawn: Birkenhead Corporation Bill, Bury Corporation (Railway) Bill, Mid-Sussex Water Bill.

HOUSE OF COMMONS.

Monday, March 10.

A petition for leave to deposit a petition for a Bill was presented by the Portsmouth Water Company.

Tuesday, March 11.

The Canterbury Gas and Water Bill, the Gravesend and Milton Gas Bill, the Highham and Hundred of Hoo Water Bill, the Pontypool Gas and Water Bill, and the Thames Valley Drainage Bill, were referred to a Select Committee, consisting of Mr. C. Acland (Chairman), Colonel Dawnay, Captain Penton, and Mr. M'Innes, and Mr. Bonham Carter (Referee); to meet on Tuesday, March 18.

The Derby Corporation Bill, the Derby Gas Bill, the Huddersfield Water Bill, the Newark-upon-Trent Water Bill, the Wessenden Reservoir Bill, and the Whitehaven Gas Bill, were referred to a Select Committee, consisting of the Right Hon. J. Lowther (Chairman), Mr. Gourley, Mr. Vernon, and Mr. Lyall; to meet on Wednesday, March 19.

Thursday, March 13.

THE QUINQUENNIAL REASSESSMENT AND THE LONDON WATER COMPANIES' CHARGES.

Mr. DIXON-HARTLAND asked the President of the Local Government Board whether, in view of the re-assessment of property in the Metropolis to be made this year, he would take steps to prevent the quinquennial revision adding not only to the annual payments of the water consumers, but also enormously to the capital sum at which the Water Companies must eventually be purchased by the ratepayers.

Mr. RITCHIE said no action on his part could affect the powers of the Companies in the matter referred to.

Friday, March 14.

The Standing Orders Committee reported that in the case of the petition of the Portsmouth Water Company for leave to deposit a petition for a Bill, the Standing Orders ought to be dispensed with, and the parties allowed to proceed.

During the past week the following progress was made:—
Bills reported: Clayton, Allerton, and Thornton Gas Bill; Luton Gas Bill.

Petitions against the Gravesend and Milton Gas Bill have been presented from the Corporation of Gravesend and the Northfleet and Greenhithe Gas Company.

HOUSE OF LORDS COMMITTEE.

Tuesday, March 11.

(*Before Lord* POLTIMORE, *Chairman; and Lords* WENLOCK, ERNE, DE TABLEY, and CALEDON.)

BAILDON WATER BILL.

This Bill, in which the Baildon Local Board seek authority to obtain an additional supply of water for the district, and to construct further works, came before their Lordships to-day.

Mr. PEMBROKE STEPHENS, Q.C., and Mr. WAUGH appeared for the promoters; Mr. BALFOUR BROWNE, Q.C., represented Mr. Ayscough Fawkes, the only petitioner against the Bill with whom the promoters had not come to terms.

Mr. PEMBROKE STEPHENS, in opening the case for the promoters, gave some figures to show the steady growth of the Local Board's district. The present supply of water was only about 13 to 14 gallons per head, and was obtained mainly from springs on Baildon Moor; but owing to extensive stone-getting and other mineral operations, they feared these springs might fail. The trade and domestic requirements had risen considerably since 1880; and the Board were advised that, to put the district into anything like a satisfactory position, a supply of something like 130,000 gallons a day was required. It might be said that the present supply was 100,000 gallons; but the engineers did not think a larger quantity than 50,000 gallons was reliable. The promoters proposed to go to Hawksworth Moor and impound the waters of the Horncliffe Beck, which drained some 379 acres of the Moor. The promoters proposed to construct, in addition to the present reservoirs, which had a storeage capacity of 9 million gallons, a reservoir which would hold about 30 million gallons, of which they proposed that 7½ millions would be available for consumption, and 22½ millions for compensation. The only petitioner against the Bill was Mr. Ayscough Fawkes, the owner of Hawksworth Moor, who complained of interference with his lands and the injury done to mills by the impounding of the waters of Horncliffe Beck. But every objection, the learned Counsel contended, was covered by the Bill and the eneral law.

Mr. *J. Waugh, C.E.*, a member of the Baildon Local Board, was then examined. He said that owing to mining operations and other things the present water supply of Baildon was very unreliable; and this uncertainty was very detrimental to the interests of the district. As to the opposition of Mr. Ayscough Fawkes, in deference to that gentleman's wishes, the promoters altered their intention to place a compensation reservoir on Hawksworth Moor; and witness thought he had come to an understanding with Mr. Fawkes's Solicitor that £1000 should be paid as compensation for loss of water. Witness considered £500 ample; but at last consented to give £1000.

Mr. *B. Walker*, Engineer and Surveyor to the Baildon Local Board, and the projector of the proposed extension, stated that the existing supply was 13 gallons of water per head of the population, exclusive of that required for trade purposes. The water taken for trade purposes had risen from 828,000 gallons in 1882 to 2,914,000 gallons in 1889. On the basis of a rainfall of 12 inches, the scheme would give a supply of 20 gallons per head of a population double the present size.

Mr. *Hill, C.E.*, having spoken to the necessity for a further supply of water, the case for the promoters concluded.

Mr. BALFOUR BROWNE stated that Mr. Ayscough Fawkes had from first to last objected to any meddling with the Horncliffe Beck. Not wishing, however, to stand in the way of the Baildon people, if they really wanted water, he offered to accept compensation. But they would not give enough. Possibly some little water was required; but the whole of the evidence went to show that they could get it within their present district, only it would cost a little more money.

Their Lordships, after a short consultation, were unanimously of opinion that the preamble of the Bill was proved.

The clauses were then gone through, and the Bill was ordered to be reported to the House.

Wednesday, March 12.

DEWSBURY AND HECKMONDWIKE WATER BILL.

This Bill came before their Lordships to-day. It has for its object the extension of the time limited by the Dewsbury and Heckmondwike Water-Works Act of 1876 for the construction of certain reservoirs and works authorized, and to extend the powers of the Dewsbury and Heckmondwike Water Board, the Corporation of Dewsbury, and the Heckmondwike Local Board.

Mr. BALFOUR BROWNE, Q.C., and Mr. FREEMAN represented the promoters; Mr. PEMBER, the Heckmondwike Local Board, who petitioned for certain additional clauses; and Mr. PEMBROKE STEPHENS and Mr. WORSLEY TAYLOR, for the Batley and Halifax Corporations, who opposed the Bill.

Mr. BALFOUR BROWNE, in his opening address on behalf of the promoters, said one of the objects of the Bill was to extend the time for completing certain works; the next was to supply water in bulk to any Local Authority within five miles from any of the conduits belonging to the Water Board; the third object was to enable the Board to lend money to other Local Authorities in order that they might carry out the provisions of the Bill, and lay pipes to distribute the water which it was proposed to deliver to them in bulk; and the fourth object was to authorize the Heckmondwike Local Board to enforce regulations for preventing waste of water. Dewsbury had these regulations already, but Heckmondwike had not; and they thought they ought to have them. The first Act he would refer to would be one passed in 1853, which was to enable the Corporation of Dewsbury to supply their own district, Heckmondwike, and Batley. In 1856 another Act was obtained; and the three authorities became joint proprietors of the water supply, and managed the works by means of a Joint Committee; and the property was invested in the three Boards. In the year 1860 the Dunford Bridge reservoir failed; and in 1867 an Act for a new embankment was promoted. In 1871 Batley found it necessary to go to Parliament for an independent scheme of water supply; and provision was made in their Act for the separation of Batley from Dewsbury and Heckmondwike, as well as for the sale of their portion of the works of the Joint Board to Dewsbury and Heckmondwike. In 1876 an Act was passed, authorizing the purchase by Dewsbury and Heckmondwike of the Batley share of the undertaking. Dewsbury was to be the owner of three-fourths and Heckmondwike of one-fourth. In 1887, a Provisional Order was obtained, by which the Corporation of Dewsbury were empowered to purchase 12 feet of the top water of the Dunford Bridge reservoir, which amounted to 88 million gallons. The population of Dewsbury at the present time was 33,000; and of Heckmondwike, 11,000. The population was rapidly increasing; and the requirements of the two towns at the present time were 1,320,000 gallons of water a day. The Water Board also supplied Ossett with 129,000 gallons, and Skelmanthorpe with 26,000 gallons per day. They had also sold to Soothill Nether 86,000 gallons, and to Ravensthorpe 72,000 gallons; making the present requirements of the borough 1,663,500 gallons a day. When the Upper Windleden reservoir was completed, they would only have 2 million gallons, and this would not leave a proper margin. Therefore they thought it was necessary to complete the Harden and Snailsden reservoirs, and not allow the powers to lapse; and they now asked to have the time extended.

Mr. PEMBER here intimated that certain clauses which the Heckmondwike Local Board wanted inserted in the Bill having been arranged with the promoters, they withdrew their opposition.

Evidence was then called.

Mr. *G. H. Hill* said he had been connected with the water-works for 25 years. The present supply of water to the district was derived from a drainage area of 2000 acres, situated at Dunford Bridge, from which a supply of 2,000,000 gallons was obtained after paying compensation water. The present requirement of the district for a proper supply of 30 gallons per head per day was 2,100,000 gallons

Mr. *T. B. Fox* said he was an Alderman of the Dewsbury Corporation and the Chairman of the Water Committee. The present storeage available was 1,100,000 gallons per day; and when Windleden reservoir was completed, they would have a total capacity of 2,000,000 gallons a day. To supply 30 gallons of water per head per day, they would require 1,300,000 gallons. Dewsbury first supplied Ossett in June, 1887. They were invited by the Ossett Local Board to tender; and their tender of 6d. being the lowest, was accepted. The minimum supply was 1 million gallons; and the maximum, 2 millions for the first ten years, and something more for the next ten years—the contract being for twenty years. For all the districts of supply, 2,000,000 gallons

were at present required. The rateable value now was £113,600; and he thought it necessary for the trade of the town that an increased quantity of water should be obtained. They had already purchased the land for the two reservoirs; and they had only one year from next July in which to construct the works. The price given for the land was £5300. Applications had been made by Flockton, Hepworth, Denby, and Witley Upper for water; and they were anxious to give them a supply—being quite capable of doing so with the powers of the Bill. The Local Board of Cumberworth applied for a loan of money for water purposes. The financial position of Dewsbury was very satisfactory; and the advantage they had, of obtaining money on favourable terms, justified, he thought, their object in lending money to other authorities taking water from them in bulk. As regards the Halifax Corporation, they had offered to them a saving clause protecting all their rights.

Thursday, March 13.

On the resumption of the proceedings this morning,

Mr. BALFOUR BROWNE announced that, since the previous day, the Halifax Corporation had accepted the terms offered three months ago, and withdrawn from the inquiry.

Mr. *C. T. Edwards*, formerly Town Clerk of Dewsbury, deposed that it was upon his advice that powers were taken to supply adjoining districts; and he founded his counsel on the request of the Local Government Board Inspector and the Duke of Richmond's Committee. Dewsbury was so situated that it could raise money on advantageous terms; and the Inspector had called upon the outlying townships to procure a supply of water. The Water Board provided Ossett with water under the powers of the Acts of 1856 and 1876. Ossett was supplied from a reservoir in Batley, which belonged to the Board.

The CHAIRMAN remarked that something had been said about the promoters being willing to exclude the area to the west.

Mr. FREEMAN said they were perfectly willing to exclude the area to the west, with this exception, that if the pipes of the Board passed through a district a little bit towards the west, that district, being practically within the limits of their supply, should be wholly so, and also that the existing rights of Heckmondwike over adjoining places should be preserved. The main object of this concession was to meet the point raised the previous day—that they should not go over and beyond the Batley pipes. After that concession was made, they would be in their geographical district, and Batley would be geographically in its own district.

Mr. *Fallas*, Clerk to the Local Board of Ossett, stated that he was appearing before the Committee to support the Bill upon the authorization of his Board, who were perfectly satisfied with the present supply both as to quality and quantity. They had an agreement with Dewsbury to supply them with 52 million gallons a year at 6d. per 1000 gallons. The Dewsbury district was within 150 yards of Ossett; while the nearest point to Batley was a mile and a half distant. The intervening 150 yards between Ossett and Dewsbury belonged to Dewsbury, having been acquired by Dewsbury for the purpose of a sewage farm.

This was the case for the promoters.

Mr. PEMBROKE STEPHENS then addressed the Committee on behalf of the Batley Corporation. He said that the powers which the promoters sought for, they had had for some time; and the fact that they sought an extension of time for ten years did not look as if even the promoters thought that part of the Bill was particularly urgent. As to Ossett, he urged that, being separated by an intervening 150 yards of land, Dewsbury had no legal right to supply the district; and the only reason for the introduction into the Bill of the 5-mile limit was to cover this. The supply by Dewsbury to Ossett had no foundation in law; and it was made in bad faith. Dewsbury had no right to sell one drop of water, directly or indirectly, in Batley. Yet they supplied Ossett with water from a reservoir in Batley; the main pipes passing through Batley. This water was supplied without parliamentary sanction, and by under-selling Batley, which had powers to supply the district. He hoped the Committee would not countenance this agreement with Ossett.

The Committee, after a short consultation, expressed the opinion that the Bill should be allowed to proceed, provided the clauses having relation to powers to enable Dewsbury to lend money to local authorities for purposes of water supply were struck out, and proper provision made to exclude the area covered by the Batley works, as suggested by the promoters' Counsel.

Gas-Meter Rents in Burnley.—At the monthly meeting of the Burnley Trades' Council last Wednesday, a report was presented on the result of the deliberations of the various trades on the question of the high charge for meter-rents in Burnley. A resolution was adopted denouncing the rents; and the executive were instructed to devise a scheme for securing their abolition or revision, and report to the next meeting.

New Joint-Stock Companies.—The Foreign and Colonial Electrical Power Storeage Company, Limited, is a new Company, with a capital of £100,500, in 20,100 shares of £5 each, whereof 100 are founders', and the remainder ordinary shares. It is stated that the Company is established to acquire numerous foreign and colonial patent rights for inventions relating to the storeage and supply of electricity on the "E.P.S." system; but nothing is mentioned in the prospectus as to what these rights consist of. Key's Electric Company, Limited, is the title of a Company which has been registered, with a capital of £15,600, divided into 3000 ordinary shares of £5 each, and 600 founders' shares of £1 each, to carry on the business of electrical and mechanical engineers, and makers and sellers of appliances required for use in connection with the generation, distribution, and employment of electricity. The Rivers Purification Company, Limited, has been registered, with a capital of £100,000, in £5 shares, to develop certain patents of Benjamin Jagger in connection with the purification of sewage liquids and of rivers, and to carry on the business of manufacturing, utilizing, applying, and working carbon refuse and other materials for purifying rivers, streams, and canals.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

Saturday, March 15.

(*Before Mr. Justice* CHITTY.)

The Lothammer Gas Manufacturing Company, Limited.

Three petitions which had been presented for the winding up of this Company came before the Court to-day.

Mr. R. ROMER, Q.C. (with whom was Mr. C. MITCHELL), appeared in support of the first petition—that presented by Mr. C. E. Parker-Rhodes. He said there was no doubt there must be a winding-up order; the only question being on which of the three petitions it should be made. The Company was incorporated on Nov. 29, 1889, with a nominal share capital of £60,000, in £1 shares, to work certain patents of Mr. Lothammer. Only 6369 shares were allotted to the general public, 38,000 shares having gone to Mr. Lothammer, vendor to the Company, and his nominees, besides £2000 in cash. A large proportion of the vendor's shares went to the promoters of the Company. A Committee of Investigation had been appointed by the shareholders who had paid cash for their shares; and in consequence of the report drawn up by this Committee, the whole of the Directors of the Company resigned, and the members of the Committee of Investigation were appointed to act as a Provisional Board, with Mr. Parker-Rhodes as Chairman. On Dec. 9, 1889, an action was brought by the Company against the promoters, seeking to recover the value of the shares they had obtained; and an injunction had been applied for to restrain them from parting with them in the meantime. The landlord had distrained for rent; and some of the shareholders threatened to commence proceedings to have their names removed from the register, on the plea of alleged misrepresentation. On this ground some of them declined to pay what was due from them upon their shares—about £1300. They were able to pay; and if a winding-up order were made, they would be compelled to. There was an amount of about £500 due to creditors besides the landlord. All the cash that had been received was spent; there being only a balance of 1s. 5d. at the bank. Under these circumstances, the petitioner, on behalf of himself and other shareholders, submitted that a winding-up order should be made on his petition.

Mr. MITCHELL said the action which had been brought against the promoters must come to an end if the Company was not wound up, as there was no money to carry it on.

Mr. BARNARD appeared for the Company, and consented to the order being made. He said he had written consents from 1185 out of the 6369 shareholders; but verbally they had practically all consented to support the petition.

Mr. EMDEN, who appeared for creditors, also supported a winding-up order.

Mr. W. B. HART, a shareholder holding one share, appeared in person, and opposed the petition.

Mr. BYRNE, Q.C. (with him Mr. ASHTON CROSS), appeared for the second petitioner, Mr. T. Boyes, a creditor for £21, and asked that the order might be made on his petition.

Counsel appeared on the third petition—that presented by Mr. G. White, a judgment creditor for £37—and supported Mr. Romer's petition.

His LORDSHIP, in giving judgment, said the first matter that he had to consider was the question of the commercial solvency of the Company—that was to say, could it now pay its debts, not whether it would ultimately be solvent or not. The answer appeared to him to be that it could not. The total amount of the debts of the Company was a little more than £500; and the cash in the coffers of the Company was represented by the sum of 1s. 5d. With regard to the £1300 due from shareholders upon calls, it had been proved that some of these shareholders disputed their liability. Of course, if the £1300 were paid, there would be enough to meet the debts of the Company; but, unfortunately, it was not paid. In his opinion there had been enough shown to justify him in making a winding-up order; and this being so, he would make it on the petition of Mr. Rhodes. The other two petitions would be dismissed, with costs.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, March 11.

(*Before the* MASTER OF THE ROLLS *and Lord Justice* FRY.)

Mayor and Corporation of Salford v. Lever.

This was an appeal by the plaintiffs against the decision of Mr. Justice Lawrance, overruling the Master ordering the plaintiffs to answer certain interrogatories.

Mr. HENN COLLINS, Q.C. (with whom was Mr. LUSH), said the Corporation of Salford were suing Mr. Ellis Lever to recover a sum of money which they said was received by him in excess of the proper price payable by them to him for coal supplied; and they alleged that the price so paid was in excess inasmuch as Mr. Lever had made a fraudulent agreement with their former Manager, Samuel Hunter, to allow him 1s. a ton in consideration of Hunter recommending Lever's coals to them. In the action, the plaintiffs had interrogated the defendant as to the existence of the agreement with Hunter; and he had refused to answer, on the ground that the answers would tend to criminate him. Notwithstanding this, he had now administered to the Corporation interrogatories of a similar nature; asking them to say when the agreement was made, and what was the consideration for it. It was a little strange that, having refused to answer, upon the ground that doing so might tend to criminate him, he now came and asked the plaintiffs how much they knew about the matter; he having taken up the position that he was not bound to give them any information on the subject. The Town Clerk declined to answer certain of the interrogatories, on the ground of privilege. He said he knew nothing about the matter except what he had learned in his capacity of Solicitor for the Corporation, with the view of preparing the case for trial.

Lord Justice FRY asked whether it was a common practice for a defendant to interrogate a plaintiff as to what he knew about the defendant's case.

Mr. HENN COLLINS said it ought not to be.

The MASTER of the ROLLS thought that objection should have been taken to the form of the interrogatories.

Mr. HENN COLLINS admitted that possibly this would have been the proper course to have adopted. He contended that information *bonâ fide* acquired by the Corporation for the purpose of the litigation ought not to be disclosed by the Town Clerk, who was acting in the capacity of Solicitor.

Lord Justice FRY said he could not possibly see how the answers to the interrogatories could be used by the defendant at the trial.

Mr. HENN COLLINS said if the defendant had the answers he would know the high-water mark of the plaintiffs' information; and if he were fraudulently inclined, he might know how far to go himself.

Lord Justice FRY did not see what legitimate use the interrogatories could be to any human being.

Mr. HENN COLLINS said they would give the defendant a free hand in shaping his case.

Lord Justice FRY: What you mean is that the defendant will swear to anything the plaintiffs do not know?

Mr. HENN COLLINS: Yes.

The MASTER of the ROLLS said it was really asking what the plaintiffs were going to put in their brief.

Mr. HENN COLLINS said that was what it amounted to. They had told the defendant that the agreement in question was not in writing. Mr. Justice Lawrance had decided the case upon the authority of the *Mayor of Swansea v. Quirk* (5 C. P. Div., p. 106). One of the interrogatories asked the plaintiffs to state the time, the sums, and the mode of payment by which the defendant paid the £1600 referred to in the statement of claim; and to this the claim of privilege was set up. The next interrogatory was as to the actual market price of the coal agreed to be sold by the defendant to the plaintiffs under the contract of July, 1877, and by what standard they alleged that the correct price was fixed. Further, what was the standard by which the plaintiffs alleged that the contract exceeded the market price, and what other tenders were sent in to the plaintiffs' Manager at or about the time of the defendant's tender; also the amounts of the other tenders. In addition to the plea of privilege, the plaintiffs declined to answer part of this interrogatory on the ground of irrelevancy. The next interrogatory was as to the plaintiffs' source of information that bribes had been paid by the defendant to Hunter; and what steps were taken in consequence, and when. They were also asked to describe in detail the proceedings taken by them against Hunter; and to give the title, name, and reference to each action, and the proceedings taken thereon. The plaintiffs objected to answer this interrogatory, on the same ground as before; and they further stated that it could not be answered without disclosing the names of the persons who had given them information, and whom they intended to call as witnesses. The next interrogatory was with the view of discovering whether an account of the sums alleged to have been paid to Hunter had been demanded from him or rendered by him to the plaintiffs. The plaintiffs also declined to answer this interrogatory, on the ground of privilege.

Mr. GAINSFORD BRUCE, Q.C. (with whom was Mr. C. M. ATKINSON), who appeared for the defendant, said the only question that was discussed before Mr. Justice Lawrance was that of privilege; and to this point he would at once address himself. He submitted that the Town Clerk had no personality; he was the representative of the Corporation, and as such was bound to answer the interrogatories.

The MASTER of the ROLLS observed that the answer was that, as Town Clerk, he had no information; what he possessed had been acquired while acting as Solicitor.

Lord Justice FRY: Suppose the plaintiff was a private individual, if he said the only information he had was acquired from his Solicitor, would he be required to answer any more?

Mr. GAINSFORD BRUCE said he thought not. The Corporation were bound to make inquiry from their agents; and a Town Clerk who had obtained information on behalf of a Corporation was not entitled to set up the privilege of a Solicitor.

Lord Justice FRY asked what use the defendant could make of the answers.

Mr. GAINSFORD BRUCE said if they could obtain the tenders, and it was found that theirs was the lowest, this would be strong evidence to show that they had not agreed to give 1s. a ton to Hunter. The Corporation must know what tenders they had, as they must be entered in the books.

Lord Justice FRY did not think this would have any bearing upon the question of bribes.

Mr. GAINSFORD BRUCE thought it had; because if the defendant's tender was the lowest, he either did not give a bribe, or other people bribed more than he did.

The MASTER of the ROLLS thought the Corporation could not make any case against the defendant unless they proved that he agreed to pay 1s. a ton to Hunter, who obtained him the order. Was not the object rather, not to find out how much but how little the plaintiffs knew?

Mr. GAINSFORD BRUCE thought he was entitled to know when the bribes were made or paid.

Lord Justice FRY said he did not see how it could matter to the defendant if he had not bribed Hunter.

Mr. GAINSFORD BRUCE submitted that he was entitled to get out all the facts that were material to the issue. In support of his contention, he cited the case of the *Southwark and Vauxhall Water Company v. Quick* (3 Q. B. Div.).

The MASTER of the ROLLS, in delivering judgment, said in his opinion such a set of interrogatories had never been allowed to be answered. It was really an attempt by the defendant to find out from the plaintiffs, not how much, but how little they knew. In order to get this information, the defendant was trying to break down the confidential relation which existed between a Solicitor and his client; in fact, trying to obtain the contents of the plaintiffs' brief. Whether the plaintiffs might not have taken some other means of answering the case, might be open to discussion; but they had given an answer which, unless the Town Clerk was not to be considered as a Solicitor, was fatal. He said that as Town Clerk, and before the litigation commenced, he knew nothing of the matters in question; but since the litigation was imminent, he had been acting in the capacity of Solicitor to the plaintiffs, and in such capacity had sought for, and obtained information to enable them to carry on their action. The privilege was not that of the Solicitor, but of the client. He thought the learned Judge was misled by the case of the *Mayor of Swansea v. Quirk*; but in that case the plaintiffs had to answer by the Town Clerk, or "by some other servant," if there was such a servant in their employ, who had the information. But this was not so in the present case, because the Town Clerk had been called upon to answer the interrogatories.

Lord Justice FRY concurred; saying that the interrogatory as to the market price of the coal was wholly unnecessary, as the price must be within the defendant's own knowledge, he being a coal merchant. The proper answer to the interrogatories would be to hand to the defendant the plaintiffs' brief; and this, in his Lordship's opinion, was really what was asked for.

The appeal was allowed, with costs.

DERBY POLICE COURT.—Wednesday, March 12.

(*Before Messrs.* BAILEY *and* BEMROSE.)

The Supply of Gas Company's Accounts to the Public.

To-day, the Derby Gas Company were summoned on the complaint of the Town Clerk (Mr. H. F. Gadsby) that they, on the 5th and 10th of March, did not sell to him or to Mr. R. J. Fittal, who then applied for the same at the Gas Office, copies of the annual statement of accounts of the Company made up to the 31st of December, 1871, 1872, 1873, 1874, 1875, 1880, and 1885, and in the form, and containing the particulars specified in Schedule B of the Gas-Works Clauses Act, 1871, and that such default continued on the 6th, 7th, and 8th inst.

The TOWN CLERK prosecuted; Mr. A. G. TAYLOR appeared for the Company.

The TOWN CLERK, in opening the case, explained that the Company were promoting a Bill in Parliament for the extension of their works, and that it was being opposed by the Corporation. The accounts of the Company were required for the purposes of the opposition; and on the 5th of March, a notice arrived from London saying that the Bill was down for that day fortnight. Accordingly, he (Mr. Gadsby) applied to the Secretary of the Company for copies of the accounts since 1871. He was refused, but had since been supplied with copies of the accounts since 1876, with a letter from the Solicitors of the Company to the effect that they were not compelled to supply copies prior to that date. He could not urge upon the Bench too strongly the great importance of the accounts to him, in the opposition to the Bill. Their opposition was rendered futile if they could not have the accounts. He proceeded to point out that by Act of Parliament the Company were compelled to supply the accounts. The notice that the Bill was down on March 5 for that day fortnight, came as a surprise. The time was short enough to prepare his case; but the action of the Company had now reduced it to six days, and the Bench would see the great importance of the case.

Mr. *Fittal* proved making applications for the accounts, part of which were supplied to him. He did not offer to pay for the copies; but had money specially provided for the purpose.

Mr. TAYLOR, for the defence, contended that the Company were not liable, as no money was tendered for the accounts. With reference to the accounts between 1871 and 1876, they were not under the Act of Parliament which compelled them to render the accounts until 1876—in fact, they had not the accounts for the years 1871 to 1876.

Mr. BAILEY said the Bench had been very anxious to settle the matter without any prejudice. They had decided to convict the Company for not having supplied seven copies of accounts on seven days; and they would be fined 1s. per copy per day.

Mr. GADSBY said that order would be of no use to him, because it would pay the Company to set him at defiance.

Mr. BAILEY: We cannot alter it.

The Minerals Under the Doncaster Water-Works.—Last Tuesday, the Doncaster Town Council in committee had under their consideration a report respecting the minerals beneath the water-works. It will be remembered the Corporation had notice that the minerals were about to be worked; and the question was whether the working would endanger the reservoir, and whether they had not better purchase the minerals. The Corporation, after hearing the report, decided that, seeing the coal was 703 yards below the reservoir, and taking into consideration the value of the minerals, estimated at £16,000—looking at the risk and considering the value of the minerals—they thought the risk might reasonably be incurred, and would decline the option of purchase.

Carlisle Gas and Water Works Benefit Society.—The annual tea and concert in connection with this Society took place in the Carlisle City Hall last Tuesday; nearly 300 of the employees and their wives and families being present. After tea there were a few speeches. The Mayor (Mr. R. Forster), who presided, said he always took a delight in assemblies such as that of the gas and water works employees; and was very pleased to see the kindly feelings which subsisted among them. No one took a greater interest in the welfare of the men than did Mr. Hepworth, the Engineer and Manager; and it was owing to him that the Society, of which he had been a promoter, had proved so great a success. Mr. Hepworth, commenting upon the Society's condition, said it was established in 1872, and had had a very successful history. They had always prospered—always been able to save up a little against a rainy day. The Society had never been more useful than the last three months in providing for individual members and their families a great deal more than it was receiving from them. The balance at the beginning of the past year was £344; at the end of the year it had risen to £366. The contributions from the workpeople and the Gas Committee during the year amounted to £67; while the outgoings were only £48. The concert was then proceeded with, and a very pleasant evening was spent.

MISCELLANEOUS NEWS.

PRESENTATION TO MR. FRANK LIVESEY.

Yesterday, the chief officers of the engineering staff of the South Metropolitan Gas Company waited upon Mr. Frank Livesey, at the Old Kent Road works, and presented to him a handsome silver salver, engraved with the following words:—"Presented (together with an address) to Frank Livesey, Esq., M. Inst. C.E., Chief Engineer of the South Metropolitan Gas Company, by the engineering staff of the Company. 17th March, 1890." The address referred to was in the following terms:—

We, the Engineering Staff of the above Company, desire to avail ourselves of the opportunity afforded by the successful termination of the strike of stokers, to place on record our feelings of respect and loyalty towards you as our chief, and our admiration of your professional ability and administrative capacity, and our grateful sense of the uniform courtesy, kindness, and consideration which have marked your dealing with us, both before and during the crisis. We feel that our official connection with you especially qualifies us to recognize the arduous duties and responsibility of your position, and to appreciate the fact that the triumph of the Company is largely due to your excellent organization, steadfastness, and zeal in the discharge of your onerous duties.

In token of our personal regard, we beg you to accept the accompanying silver salver, with the hope that you may long be spared to occupy the position which you fill so worthily, and that a long period of success and prosperity lies before you and the Company.

(Signed)	J. F. Braidwood	John Somerville
	Joseph Tysoe	A. F. Browne
	Chas. C. Carpenter	Thos. H. Nixon
	Charles W. Tanner	Chas. Dru Drewry.

The presentation was made, in appropriate words, by Mr. John Somerville; and, in reply, Mr. Frank Livesey said that the meeting and its object came as a great surprise to him. A few minutes before, he had met one of the Engineers entering the office; but had no idea even of the errand he was on. He was especially pleased that the presentation just made to him had come from the engineering staff by themselves; since he felt that it was they alone who were in a position of being able to realize the anxiety he had borne in common with them from June last. With them, he perceived that a strike would be forced on the Company sooner or later; and his chief desire was to put it off at any rate until after Christmas. He felt that once the fight had commenced, at all costs the Company must win; and he would take this opportunity of acknowledging the earnest way in which the gentlemen present had worked to accomplish this end. He should ever value the address and its accompanying gift, in remembrance of a time he was never likely to forget. He concluded by once more thanking them for the good feeling that prompted the presentation.

PRESENTATION TO MR. H. TOWNSEND, OF DEWSBURY.

Last Tuesday evening, an interesting presentation was made by the workmen employed at the Dewsbury Corporation Gas-Works to Mr. Henry Townsend, C.E., the Engineer and Manager of the works, as a token of their respect and esteem on his leaving Dewsbury to fill a similar position at Plymouth. About 5 o'clock the men met together in the joiners' shop, which they had decorated for the occasion. Mr. F. Scholefield was voted to the chair; and after a few appropriate remarks, he called upon Mr. G. W. Fligg to make the presentation. Mr. Fligg eulogized the services Mr. Townsend had rendered to Dewsbury, and said the Corporation were sustaining a great loss by his removal. He then presented Mr. Townsend with a handsome timepiece and bronze ornaments. The plate bore the following inscription:—"Presented to Mr. H. Townsend by the workmen employed at the Corporation Gas-Works, as a token of their respect on his leaving Dewsbury to take charge of the Gas-Works at Plymouth. March 11, 1890." He proceeded to remark that every man on the works had subscribed to the testimonial as soon as it was started; and that no better testimony than this fact could be needed of the good feeling existing between Mr. Townsend and his men. He also alluded to the many improvements which had been made at the works under Mr. Townsend's direction; and, in conclusion, expressed the hope that Mr. Townsend, and his wife and family would enjoy the best of health in their new sphere of labour, and that they would long live to look upon their present as a token of the many friends they had left behind them at Dewsbury. Mr. Bradley, the foreman of the works, Mr. W. Keyte, and several of the workmen also addressed the meeting, the latter speaking in feeling terms of the kindness they had always received at the hands of Mr. Townsend. Mr. Townsend, on rising to respond, met with a hearty round of applause. He warmly thanked them for their handsome present, and said that much as he should value it, he should value still more the kind feelings of which it was the emblem, and that every time it caught his eye, he should be reminded of the happy days he had spent amongst them. He had been much touched by the regret which had been expressed to him personally by nearly every man on the works; and he could assure them that he should never forget them. He also thanked them for their kind allusions to his wife and family; and he concluded by wishing them every happiness, and hoping they would all long be spared to enjoy the fruits of their arduous toil. Mr. Townsend then invited the men to partake of refreshments. A vote of thanks to Mr. Scholefield for presiding concluded the first part of the ceremony. Afterwards the presents were removed to the Wellington Hotel where Mr. Townsend entertained a large number of officials and friends in a most hospitable manner. Songs and recitations were given; and before separating, Mr. H. C. Marks, the Borough Engineer, proposed a vote of thanks to Mr. Townsend for the excellent manner in which he had entertained them; and in an eloquent speech, mentioned the harmonious way in which Mr. Townsend and himself had always acted together. He and the Corporation knew that Dewsbury was sustaining a severe blow in losing their Gas Engineer; but he trusted he would be happy and prosperous in his new home, and that he would not forget the many friends he was leaving behind in Dewsbury. Mr. R. Lumb, the Outdoor Superintendent of the Gas Department, seconded the vote of thanks, and called upon the company to drink Mr. Townsend's health, which was done with great cordiality and musical honours. Mr. Townsend, in thanking his guests, said he should never forget the kindness he had at all times received from his brother officers, and also from the citizens of Dewsbury.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. Frederic Lane Linging in the chair.

The Secretary (Mr. Magnus Ohren) having read the notice convening the meeting, it was agreed to take as read the report of the Directors and the statement of the accounts for the half year ending Dec. 31, some particulars from which were given in the Journal last week, p. 447.

The Chairman, in moving—"That the report of the Directors, and the balance-sheet, examined and signed by the Auditors, be received, adopted, and entered upon the minutes," said that the third paragraph in the report stated that "wages are permanently increased to a very considerable extent." At the previous half-yearly meeting, he made allusion to the concessions they had granted to the stokers and other men in the Company's employ, which involved a large increase in wages and a reduction in the hours of labour. The result of this was that the carbonizing wages had risen by upwards of 46 per cent. In connection with this subject, it was only right that he should observe, respecting their workmen, that during the past six months they had gone on in a fairly satisfactory manner. They had had no real disputes with them. Only matters of a trifling character had cropped up from time to time, which their Engineer (Mr. C. Gandon) had always been able to settle. In looking back over the years during which he had been connected with the Company, he could not realize any reason why there should be any dispute between the workmen and the Company; for the Directors had invariably tried to do all they possibly could to promote the interest and the welfare and comfort of the men; and they naturally asked them at a time like the present, when there was so much excitement in the gas world, to be loyal to the Company. He approached this subject with reluctance; but he should not be doing his duty if he refrained from informing the shareholders that the concessions to the men involved a very serious charge against the revenue. He would take this opportunity of saying that the Directors felt greatly indebted to their Engineer for the judgment and (when necessary) firmness, tempered with a conciliatory feeling, with which he had carried the Company through the past six months. He (the Chairman) hoped that they would continue in harmony with the men; and everything would then proceed satisfactorily. Mention was also made in the report of the increase in the price of coal. The Directors did not contemplate at the time of the previous half-yearly meeting that there would be this extraordinary rise. But happily, as far as they were concerned, it had not been, and was not now, a very serious matter, from the fact that their coal contract (which was made in the spring of last year under favourable circumstances) would not expire until very nearly the close of the present half year; and when the Directors met the shareholders in the autumn, they entertained the hope that they would be enabled to show results equally as good as those now being submitted. They had been very disappointed in reference to the price realized for coke. It was a very singular circumstance that, although the price of coal had risen to such a considerable extent, there had been no corresponding benefit in the price of coke. The results of the half-year's working the Board regarded as satisfactory, although they took the precaution to state in the report that the dividends recommended had not quite been earned. And that was so upon the bare working of the concern; but if they took—as they were entitled to, and had always done—the interest on their reserves and on the deposit at the bankers, they had not only realized the whole of the dividends, but were enabled to carry forward a sum of £600 to the present half-year's accounts—they augmented the floating balance, and carried forward a sum of upwards of £14,000, to meet any contingency which might, but he hoped would not, arise. In regard to the quantity of gas sold, there had been an increase to the extent of 4·45 per cent. Their progress in this direction was such that the Board had been compelled to take into serious consideration the necessity of providing a larger amount of storeage room for gas; and they had determined to construct a tank during the summer of the present year sufficiently large to receive a three-lift holder of a capacity of about 2,500,000 cubic feet. The holder, however, would not be erected until the summer of 1891. It might here be mentioned that, although they were going to contract liabilities in outlay, it would not be necessary to call upon the shareholders for any contribution during the current year, as they had sufficient money in hand to enable them to meet any claims made upon them under this head. The sale of gas during the half year for purposes other than lighting had been very gratifying; and he believed the time was not very far off when the sale of gas for heating, cooking, and manufacturing, would form a very large item in the business of all gas companies. It has been his good lot at almost every half-yearly meeting to submit accounts showing decreases in the charges for working. Unfortunately, he was compelled on this occasion to allude to increases under the head of manufacture. Comparing the figures with the corresponding period of 1888, coal exhibited an increase of £2435; purification, £597; carbonizing wages, £1892; and renewal of retorts, works, &c., £389. Under the heads of distribution, rents, rates, and taxes, and management, the advances had been small—amounting in the aggregate to not more than £300. Turning to the credit side of the account, the gas-rental was less by £851; but this had arisen entirely from the

reduction in the price of gas. In the December half of 1888, they were charging 2s. 9d. and 2s. 8d. per 1000 cubic feet; whereas, in the past half year, they had been charging 2s. 7d. and 2s. 6d. Respecting residual products, coke only showed a small advance of £75 over the corresponding half year, when coal was selling at a very low price. Breeze had given them a little extra return; and tar had increased considerably, by £1175. Sulphate of ammonia and ammoniacal liquor had produced an additional £260. During the six months they had carbonized 2307 tons of coal more than they did in the second half of 1888; but the cost had been 5d. per ton more. The gas sold in the six months amounted to 370,814,000 cubic feet, or an increase of 15,800,000 feet. The gas unaccounted for he thought would be considered as quite satisfactory—being only 5·63 per cent.; and the capital employed per ton of coal carbonized (this item they rather prided themselves upon), was only £4 10s. 1d. He thought he had touched upon all matters vital to the interests of the Company; but was prepared to afford any further information required.

Mr. GEORGE LIVESEY seconded the motion, which was carried without discussion.

The CHAIRMAN then proposed the declaration of dividends at the following rates per annum—viz., 6 per cent. on the preference stock, 7 per cent. on the ordinary 7 per cent. stock, 10 per cent. on the ordinary 10 per cent. stock, and 7 per cent. on the new ordinary 7 per cent. shares, all less income-tax.

Mr. C. LEA WILSON seconded the motion; and it was agreed to.

Mr. LIVESEY next moved the re-election of Mr. Linging to his seat at the Board. In doing so he observed that the Chairman and his (Mr. Livesey's) father were friends in early life; and there was no man whom he would have greater pleasure in proposing as a Director. Mr. Linging had been a Director for nearly 30 years; and was thoroughly conversant with all matters relating to the Company and gas manufacture generally.

Dr. HETLEY seconded the motion, which was carried *nem. con.*

On the motion of the CHAIRMAN, seconded by Mr. J. GLAISHER, F.R.S., Mr. Lea Wilson was also re-elected a Director.

Both gentlemen having acknowledged the continued confidence of the shareholders,

Mr. C. NEWTON was re-appointed an Auditor, on the motion of Mr. WESCOTT, seconded by Mr. BEETON.

Mr. R. HESKETH JONES said he had pleasure in proposing the next resolution—"That the thanks of the meeting be given to the Directors of this Company for their able management of the affairs of the Company." The Chairman had referred to the difficulties of the past half year; and although he had very modestly put himself and his colleagues on one side, and given credit to the Engineer for having successfully combated with those difficulties, they must have caused a great amount of trouble and anxiety to the Directors, and the shareholders should not hesitate to give them a very cordial vote of thanks. Upon the Board they had a gentleman who had had a hard battle to fight recently; and although he (Mr. Jones) did not wish upon that occasion to give him an additional vote of thanks, still one could not help pointing to the fact that the shareholders were fortunate in having Mr. Livesey as a Director.

Mr. ENNIS seconded the motion; and it was at once unanimously carried.

The CHAIRMAN sincerely thanked the shareholders for their acknowledgment of the services of the Directors. As to the remarks of Mr. Jones in regard to one of the members of the Board, he could only say that he knew of no man who was kinder and more considerate to working men than the gentleman referred to. He concluded by moving a vote of thanks to the Auditors and the other Officers for the efficient discharge of their duties.

Mr. LIVESEY, in seconding the motion, said that as to the officers there was no question whatever that they had had very heavy responsibilities and anxieties during the past half year. He was told only half an hour ago by a friend that the Manager of one of the Suburban Gas Companies had been obliged to go away for a month's holiday; the wear and tear of the last six months having utterly broken him down. From his (Mr. Livesey's) own knowledge, he could say that the past half year had been one of the most trying he had ever known for managers of gas-works. The engineers and foremen especially (he would couple the foremen with them, because on them had rested a great deal of the trouble and work) had had such a time of it that he was quite certain, if it were repeated half year by half year, they would sever their connection with gas-works altogether. He therefore felt that on this occasion their thanks were due to the officers—particularly to Mr. Gandon. He was not going to speak in his presence, beyond saying that the Company were thoroughly well served; and they could not have a better man in his position. He had proved himself to be quite equal to the weighty circumstances under which he had been placed. He must not omit to mention Mr. Ohren, who was a very old officer of the Company; and he and Mr. Gandon worked well together in the management of the concern.

Mr. A. T. LAYTON having acknowledged the vote on behalf of himself and his fellow-Auditor,

Mr. GANDON, in responding for the officers, observed that the difficulties of the half year had indeed been greater than usual; but he should like to assure the Directors and the shareholders that, on the whole, they had on the works an excellent class of men, with whom he worked very amicably. Of course, there were a few black sheep among them, who were led by the clamour of outside agitators. The working, however, had not been quite so good in the six months, as there had been, not a spirit of discontent, but an unsettled spirit among the men, some of whom did not appear to know who were their masters. He thought, however, that the member of the Board who had been referred to had proved to the gas stokers generally in England that the masters intended being the masters, and were not going to be guided by outsiders. Mr. Livesey had alluded to the foremen. He (Mr. Gandon) could assure the shareholders that they deserved great praise, as they had had more petty anxieties to go through than perhaps he had had himself, as they came into more intimate contact with the men. In conclusion, he acknowledged the hearty support he had received from the Board.

The proceedings then terminated.

PROVINCIAL GAS COMPANIES.

The following paragraphs contain the chief features of the accounts or reports of meetings of the various Gas Companies mentioned which have been received during the past week.

The Barnard Castle Gas Company is one of the most successful of small undertakings. At the recent half-yearly meeting, it was reported that during the past twelve months great improvements had been made at the works, and all the expenditure incurred had been paid out of revenue account, leaving the reserve fund untouched. A year ago it was agreed to reduce the price of gas 3d. per 1000 cubic feet; and the wages account and the cost of coal during the half year had been increased. The make of gas, however, was 225,000 feet more than in the previous six months; and there were increases on the sale of tar and coke. The report was adopted; and the usual dividend of 10 per cent. per annum was declared. In consideration that the revenue had been able to meet all current outgoings with something to spare, it was decided that the price of gas should be further reduced from July next 3d. per 1000 feet; making the net charge 2s. 6d.

The half-yearly general meeting of the Dover Gas Company was held on the 3rd inst., under the presidency of Mr. W. Mannering. Owing to the high prices of coal and the rates of freight, the balance standing to the credit of the profit and loss account was insufficient by £368 to pay the usual dividend. The Directors therefore recommended that the undivided profits of previous years should be drawn upon to allow of the declaration of the usual 7½ per cent. per annum. With the exception of the cost of coals, the position of the Company was stated in the report to be highly gratifying. The quantity of gas sold had regained its normal rate of increase; the use of gas for heating and cooking was rapidly extending; and the value of coke and tar had to some extent followed the increased cost of coals. During the past half year the Directors voluntarily raised the scale of wages paid to their workmen, in accordance with the circumstances of the times, and also provided an appropriate reading-room on the works feeling assured that by these concessions they were doing much to promote the moral and intellectual condition of the employees, as well as the good feeling which had always existed between them and the Company. The works and plant (under the management of Mr. R. Herring the Resident Engineer) were kept in a high state of efficiency. The Chairman, in moving the adoption of the report, congratulated the proprietors on the results of the half-year's operations. The hopes of the Directors respecting the increase in the consumption of gas had, he said, been fully realized. The quantity of gas sold was 79,397,300 cubic feet, as against 71,780,400 cubic feet in the corresponding period of 1888—showing the large increase of 10 per cent. Owing to the higher prices paid for coals and freights, which amounted to 2s. 9d. per ton, and the larger quantity used, the total cost of coal had been increased by £1773. Fortunately this charge had been nearly met by the increased revenue, which amounted to £1770. The gas-rentals gave an increase of £1002; and residuals £710 more. The total expenditure had advanced by £2028 15s. 1d. The profit balance for the half year was £2246—within £368 of the dividend. This would be taken from the surplus profit account, which would still leave a balance of £2142 11s. 5d. to carry forward. He thought it doubtful that the Company would be able to continue to supply gas at the low rate of 2s. 7d. per 1000 cubic feet beyond the current half year. But this would depend on the terms upon which the Directors obtained a fresh supply of coal when the contracts terminated in June. Two cargoes lately purchased had cost 6s. per ton more than the contract rate. With reference to capital, since 1885 no addition had been made. During that year the quantity of gas sold was 131¼ million cubic feet, with a capital of £7 8s. 11d. per ton of coal carbonized; whereas the quantity last year sold reached 150 millions—bringing the capital down to £6 4s. 6d. per ton of coal. It was now intended to raise some additional capital. Having alluded to the extensions which are about to be carried out in the works to meet the increased demand for gas, the Chairman made a brief reference to the excellent service rendered by the officers and staff, and to the good feeling existing between all who are engaged in the Company, and concluded by moving the adoption of the report and the declaration of the dividend recommended. Mr. Bottle seconded the motion, and it was carried unanimously. Votes of thanks were then accorded to the Chairman, Directors, Engineer, and working staff, and the proceedings closed.

The report issued to the shareholders of the Goole Gas and Water Company for the year ending Dec. 31 last shows that, after providing for interest on loans, there is a disposable balance of £2292, including £162 brought forward from the previous year. In July last an interim dividend of 4 per cent. per annum was paid; and the Directors now recommend that a dividend be declared at the rate of 8 per cent. per annum for the past half year, which will absorb £1800, and make a dividend of 6 per cent. for the year, subject to income-tax. They also suggest that £300 be carried to the reserve fund; and that the balance of £192 be carried forward to next year's accounts. The Directors have, in consequence of the large increase in the price of coal, deemed it necessary, in the interests of the Company, to raise the price of gas 1d. per 1000 cubic feet, the price now being 3s. 10d.

At the recent half-yearly meeting of the Harrogate Gas Company, the Directors' report and the accounts (which were noticed in the JOURNAL for the 18th ult.) were adopted on the motion of the Chairman, Mr. Allanson; and afterwards the following dividends were declared:—£8 10s. per cent. on the "A" stock, making 16 per cent. for the year; on the "B" stock, £6 7s. 6d., making 12 per cent. for the year; and on the "C" stock, £5 19s., making 11½ per cent. for the year. The services of the Directors and of the Engineer and Secretary (Mr. P. H. Wilkinson) were duly acknowledged.

There was an increase in the quantity of gas sold by the Harrow District Gas Company in the second half of the past year; and, in the expectation that this improvement will continue, an extension of the works and mains will be necessary. This, when definitely determined upon, will, of course, be carried out under the supervision of the Resident Engineer and Secretary (Mr. J. L. Chapman, Assoc. M. Inst. C.E.). The report to be presented at the half-yearly meeting next Monday shows that the balance carried to the profit and loss account

at the end of last year was £1582; but the amount available for division is £1728, out of which the Directors recommend dividends at the rates of 7½, 7, and 5¼ per cent. per annum, on the various classes of stock, all less income-tax. The price now charged by the Company is 3d. per 1000 cubic feet less than it was in the closing half of 1888; and as coal has advanced in price, no further reduction will be possible at present.

The annual report of the Directors of the Harwich Gas Company, submitted at the meeting of the shareholders last Wednesday, stated that the price of gas had been reduced; and had resulted in a decrease in the rental of private consumers of about £277, and in the public lighting of £84; showing a total loss of £362. The reduction in price, and the portion of the cost of new mains charged to revenue, rendered necessary smaller dividends than in 1888; these being at the rate of 8 per cent. on the original issue of shares, and 5⅜ per cent. on the new issue. The report was approved and passed.

The fourteenth annual general meeting of the Londonderry Gas Company was held on Monday of last week—Mr. R. W. Newton in the chair. The report read by the Secretary and Manager (Mr. J. Macnie, Assoc. M. Inst. C.E.) stated that the accounts for the year ending Dec. 31 last showed profit equal to the payment of a dividend of 10 per cent., with a balance of £619 to be carried forward. The quantity of gas sold last year was 4¼ per cent. greater than that for the preceding twelve months. In moving the adoption of the report, the Chairman referred to the satisfactory working of the undertaking; remarking that not only had the sale of gas increased, notwithstanding the extensive use of petroleum, but the receipts derived from coke and the other residual products had been larger than was anticipated. At the present price of gas, the shareholders were legally entitled, under the sliding scale, to a higher rate of dividend than they received; but the Directors believed that it was better, whenever practicable, to reduce the price of gas than to increase the dividend. The motion was carried unanimously. A vote of thanks was accorded to the Directors, for their services on behalf of the Company; as well as to Mr. Macnie, for the efficient manner in which he had conducted the business, and for his uniform courtesy and careful attention to the interests of the undertaking.

At the recent meeting of the shareholders of the Milnrow Gas Company, the report on the past six months' working, presented by the Chairman (Mr. E. Clegg), showed that there was a disposable balance of £766 (more by £104 than that for the previous half year). The report was adopted; and the recommendation of the Directors that an 8 per cent. dividend be paid was likewise approved.

A study of the accounts for the past half year which will be presented to the shareholders of the Sheffield United Gaslight Company on the 1st prox., will satisfy everyone interested in the concern that the maximum dividend will in future be maintained, without rendering an increase in the price of gas necessary; the profits on the six months' operations being about £6000 more than is required for the dividend. As to the advance which the Directors made in the wages of the stokers, and the alteration of the working to eight-hour shifts, the report states that these only applied to the last seven weeks of the half year; and, by reason of unexpired contracts and stocks of coal in hand on June 30 last, the advance in the price of that article has not affected the profits to so great an extent as it would have done, had it applied to the whole of the Company's requirements for the half year. To be in a position efficiently to meet the increase taking place in the consumption of gas, the Board are enlarging the storeage at the Neepsend works by about a million cubic feet. This is being effected by putting an additional lift to two of the gasholders there. The revenue account shows that the total income for the half year was £131,903, of which sum £90,945 was received for gas, £4584 by way of rental on meters and stoves, £34,103 for residuals, £1507 as profit on the fitting department, £644 represent the earnings of railway wagons, and £120 "rents receivable." The total expenditure was £92,620, of which £76,166 was spent in the manufacture of gas. The balance carried to profit and loss account is £39,283; the disposable net profit being £45,290. Of this sum £33,250 will be required for the dividends.

The report of the Directors of the Sheppy Gas Company which will be presented to the shareholders to-morrow states that the gas-rental for the year ending Dec. 31 last showed a satisfactory increase on that for the preceding twelve months, although the last reduction in price was not quite compensated for. However, the quantity of gas supplied was larger than in any previous year; and the number of consumers was augmented. Under the careful supervision of the Secretary (Mr. A. W. Marks) and the Manager (Mr. W. T. Carpenter), the working of the undertaking was carried on with the utmost economy, and the plant maintained in thorough efficiency. The receipts for gas amounted to £6505; rental of meters and fittings, £253; residuals (which advanced in all cases but that of coke), £1655—total receipts, £8821. The expenditure for the manufacture of gas was £4155 (coal costing £2931); for distribution, £223; expenses of management came to £542; the total expenditure being £5871. The balance carried to the profit and loss account is £2949, of which the sum of £1742 is available for division. The Directors recommend the declaration of full dividends, which will leave a balance to be carried forward.

The net profits of the Tonbridge Gas Company for the past year amounted to £1654, from which the usual dividends—viz., 10, 5, and 7 per cent. on the several stocks—have been declared. The revenue account showed that £4557 was received for gas, and £1147 for residual products—the total receipts being £5895. On the expenditure side, £3509 was spent in the manufacture of gas; and about £720 on distribution, management, and rates and taxes.

Sanitation in the East.—Mr. Baldwin Latham, who left England early last November to advise the Egyptian Government as to the drainage of Cairo, has, we believe, recommended a scheme for the sewerage of the city on the hydraulic system, at an estimated cost of £565,700. That sanitation is receiving very great attention at the present time in the East, is evidenced by the fact that Mr. Latham, while at Cairo, was requested to extend his journey to Bombay, and has since been asked to advise as to the sewerage and water supply of several other towns.

COLONIAL GAS UNDERTAKINGS.

Particulars relating to several colonial gas undertakings have lately reached us, among which the following may be briefly noticed.

The report of the Directors of the Australian Gaslight Company for the six months ending Dec. 31 last (the 108th half year of the Company's working) shows profits to the amount of £52,186. A dividend of 7½ per cent. for the above-named period is recommended; absorbing £46,500, and leaving £5686 to be carried forward. The Engineer (Mr. Thomas J. Bush) reports the whole of the Company's plant to be in thoroughly good working order. The Company have extended their sphere of operations by acquiring the undertaking of the Parramatta Gas Company; and the transfer of the property was to have taken place at the commencement of the present year. Certain formalities had not, however, been complied with at the time the report was issued; though doubtless the amalgamation has now been completed.

The report of the Rockhampton (Queensland) Gas Company for the half year ending Nov. 30 last states that the profit realized in this period was £2067, which, with £289 brought forward, made £2356 available for division; and the Directors recommended the payment of a dividend at the rate of 10 per cent. per annum, amounting to £1483, writing off £300 for depreciation of plant, and carrying forward a balance of £572. There was a continued increase in the consumption of gas; and great improvement was experienced in the demand for coke and tar. The Company have lately obtained power to supply the electric light, and to extend their operations to North Rockhampton. The shareholders have been circularized on the subject of erecting electric lighting plant; and the answers received will influence the Directors in proceeding or otherwise with the work.

The report presented at the recent annual general meeting of the Wellington (N.Z.) Gas Company, Limited, stated that notwithstanding the reduction made by the Directors in the price of gas at the commencement of 1888, there was no improvement in the consumption during the past year. This was attributable partly to the loss of the street lighting as from July last, and also to the more general habits of economy practised by the consumers, which modern improvements had made possible. With the steady increase which was being witnessed in the population, the Directors confidently anticipated an improved demand. A dividend of 7½ per cent. was paid in July, and a further 6 per cent. made 13½ per cent. for the year. During the twelve months the whole of the plant was efficiently maintained; the new coal-store was completed and brought into use; 1¾ miles of new mains were laid; and 145 new services fixed. On June 26 last the Company lost by death their Manager (Mr. J. R. George), who had been identified with the undertaking from its inception. The works are now under the supervision of Mr. H. P. Higginson, M. Inst. C.E.

Messrs. J. Coates and Co., of London and Melbourne, who have constructed a large number of gas-works in the colonies, have lately completed works for the supply of Box Hill and Surrey Hills—eastern suburbs of Melbourne; and their opening was celebrated by a dinner at which several persons of local importance were present, at the invitation of Mr. J. Coates, who presided. It transpired in the course of the proceedings that an attempt had been made to float a Company to serve the district with gas; but, owing to the state of the Money Market, it had failed. Messrs. Coates and Co. then took the matter in hand, and put up works, to the general satisfaction of the inhabitants. Mr. Coates stated that the plant was equal to turning out 25,000 cubic feet of gas per day; and its capacity could be doubled if required. He and his partner in the undertaking had power to charge 12s. 6d. per 1000 cubic feet; but they had fixed the price at 8s. 9d., which would be shortly reduced to 7s. 6d. The district is lighted in accordance with the views of the Directors of the Metropolitan Gas Company of Melbourne.

THE HEYWOOD CORPORATION AND THEIR FORMER GAS ENGINEER.

At the Meeting of the Heywood Town Council last Thursday—the Mayor (Mr. D. Marlor) in the chair—the report of the Sub-Committee appointed to investigate certain statements affecting their former Gas Engineer (Mr. H. Hawkins), to which several references have already been made in the JOURNAL, was presented. It was signed by the Mayor, the Chairman of the Gas Committee (Mr. J. Lawton), and three other members. The Committee expressed the opinion that the plans, sections, and elevations for the new retort-house were not prepared by Mr. Hawkins, but by Mr. W. Woodward, Gas Engineer of the Bury Corporation; and that the working details for the ironwork contract were prepared by Mr. Phillips, of Bolton, for and to the order of the iron contractors. They did not believe that Mr. Hawkins ever allowed Mr. Woodward to erase his (Mr. Hawkins's) name from the plans, and insert his own, to obtain his present situation in Bury. The Committee were of opinion that it had been conclusively proved that the plans, which are missing, were in Mr. Hawkins's possession more than twelve months after Mr. Diggle, the Borough Engineer, into whose office Mr. Hawkins had said they went from his hands, had returned them to him. The Committee exonerated Messrs. Hodgkinson and Buckley from Mr. Hawkins's charge of purchasing fire-bricks for the Corporation, which he would not allow to be used. He did not reject any fire-bricks at all until after the retort-house works were placed in the hands of the Borough Engineer. This officer rejected the bricks referred to by Mr. Hawkins, and reported the fact to the Gas Committee. It was true that Mr. Hawkins gave a testimonial to the contractors for the ironwork in recommendation of retort mouthpieces, although they were considered wholly unsatisfactory by the Committee and the Borough Engineer. The report concluded: "Having regard to the whole of the proceedings connected with the erection of the new retort-house generally, your Committee are of opinion that the late Gas Manager was either totally incompetent to undertake the responsibility of the construction of such works, or that he failed altogether to do his duty in reference thereto in the interests of the ratepayers." Mr. Healey said the report showed that the statements, or nearly all of

them, of the former Gas Manager were not true. He quite agreed with the closing sentence. Now that the whole of the particulars had come upon the minutes, the public would see what position they had stood in with regard to Mr. Hawkins. Mr. M'Farlane said the report was satisfactory to a certain extent. He believed the Gas Committee had done all they could to get information as to the missing plans; and to his mind it was deplorable that they were unable to ascertain their whereabouts. The former Manager was the man into whose possession they were last traced—at a time long subsequent to another time when he said he did not know where they were. As to Mr. Hawkins's expression that the public would hear more about the matter, he (Mr. M'Farlane) had not heard anything more yet, and did not expect to do so. The minutes were agreed to.

OLDBURY LOCAL BOARD GAS SUPPLY.

At the last Meeting of the Oldbury Local Board, the report of the Gas Committee, with the statement of accounts for the year ending Dec. 31 last, was presented. It showed that the Clerk had arranged that £3314, part of the loan of £7814, should run for 50 years from February, 1887, instead of for ten years. The balance, £4500, would run for ten years from February, 1887. The statement of accounts had been examined and approved by the Committee, who recommended the Board to adopt them. They showed that the total amount authorized to be raised was £81,222 7s. 10d., out of which there had been borrowed £81,222; leaving the odd 7s. 10d. standing. Of the total amount raised, a sum of £75,610 had been spent on works and plant. The revenue account showed the cost of the manufacture of gas during the year to be £4742 9s. 10d.; the distribution of gas, £287 8s. 9d.; lighting and repairing of the public lamps, £236 1s. 3d.; rents, rates, and taxes, £513 9s. 5d.; management expenses, £362 0s. 5d.; law costs, £342 7s. 9d.—the total expenditure being £6483 17s. 5d. The balance (being gross profit) amounted to £4757 17s. 5d. There was realized by sales of gas, £8758 7s. 9d.; by residual products, £2351 5s.; by fittings, £104 0s. 11d.; by discounts on purchases, £28 0s. 3d.—the total receipts being £11,241 14s. 10d. The gross profit for the year was £4757 17s. 5d. The interest on mortgages accrued to Dec. 31 last amounted to £3164 15s. 2d.; the loans repaid, to £1269 1s. 1d.—together, £4433 16s. 3d.; leaving a net profit of £324 1s. 2d. This, added to the amount brought from the previous account, made a total of £1682 4s. 4d. on the credit side of the profit and loss account. The working statement by the Manager (Mr. C. Meiklejohn), which accompanied the accounts, showed that 5924 tons of coal and cannel were used last year; producing 3457 tons 10 cwt. of coke, 189 tons 4 cwt. of breeze, 89,174 gallons of tar, and 175,104 gallons of ammoniacal liquor. The Chairman of the Committee (Mr. J. W. Wilson), in moving the adoption of the report, remarked that the members might be surprised to see a smaller profit than they expected. He pointed out, however, that the cost of renewing the loans—more especially the £20,000 loan—had amounted to £342. It had been thought right to place this in the revenue account for the year as law costs. As far as the manufacturing and selling account was concerned, this £342 should appear as profit. An increase of £50 over last year, with these heavy law expenses added, would show an additional profit for the year of £400. With regard to the manufacture of gas, the growth in consumption had gone on. In 1888 they had an increase of 6 or 7 per cent.; and last year there was another increase of 3,400,000 cubic feet. The cost of making the gas had been slightly less than before, which, deducting the residuals sold, left the cost at about 1s. 2d. per 1000 cubic feet, whereas in 1888 it came to 1s. 2¼d. The gas unaccounted for—another item which required watching—was practically the same as before, and was certainly not an extraordinary figure. The chief point with regard to the revenue was the item of law costs, to which he had already referred; because the money was paid last year with a view to directly benefiting the concern in the future. As they all knew, the past year would mark continued success in the manufacturing department; but the great work had been the paying off of the old loans, and getting new ones with nearly 1 per cent. less interest, besides repaying in 50 years instead of 30 as now. In future they would only have to pay £420 per annum interest, instead of £702 as before. They had something besides the law costs to pay to have these loans renewed; but there would nevertheless be a saving this year. It looked a very small thing to have only £50 profit, considering they had paid little more for wages and manufacture than the year before. They would have to face the anticipated increase in the price of coal; but they were as well off as most gas undertakings, and had enough to last them until November of the present year. The report was approved on the understanding that an opportunity would be afforded of discussing it at the next meeting.

The Electric Lighting of Drogheda.—The Drogheda Corporation, at their last monthly meeting, decided to apply for a Provisional Order to enable them to light the town by means of electricity.

Sowerby Bridge Water Supply.—At the last monthly meeting of the Sowerby Bridge Local Board, there was a discussion on the question of the water supply of the district. At their previous meeting, the Board had decided to lodge a petition against the Morley Water Bill, with the object of securing additional powers of water supply for the future. It had been necessary in the meantime to communicate with the Halifax Corporation; and the Town Clerk, in reply, had written to the effect that the matter was before the Water Committee on the 17th ult., and they objected to the Morley Corporation supplying Sowerby Bridge with water, but were prepared to recommend the Council to remove the restriction as to the maximum quantity which they were bound to supply to the Board. The Chairman (Mr. Clay) said he thought under the circumstances they might be satisfied without seeking additional powers elsewhere; and, after some conversation upon the point, it was resolved that steps be taken to embody the terms of the Town Clerk's letter in an agreement waiving the right of the Halifax Corporation to limit the supply.

LEICESTER CORPORATION GAS AND WATER SUPPLY.

Half-Yearly Financial Statements.

At a Special Meeting of the Leicester Town Council last Tuesday—the Mayor (Alderman H. Lankester) presiding—the accounts of the Gas and Water Committees for the half year ending Dec. 31 last were presented.

The accounts of the Gas Department were first submitted. From these it appeared that the net profit, after paying interest on the capital of the undertaking, was £19,493. Out of this sum had been paid £2634, the half-year's amount of sinking fund, leaving a balance of £16,859, which, added to the balance of net profit (£13,377 7s. 5d.) for the half year ending June 30, 1889, would make a total of £30,236 to be applied to the district fund at the close of the current financial year (the 25th inst.); or from which the Council might, if they were so minded, set aside a sum to be applicable for the renewal of works. The accounts included the result of the working of the residual products manufacture and the gas-fitting business. The net amount realized by the former was £9879. With regard to the gas-fitting business, the half-year's working showed a net profit of £471. The Committee recommended that a sum of £10,000 be added to the gas-works renewal fund, established in the year 1884, and that the remainder of the net balance (£20,236) be applied to the district fund. During the half year 48,556 tons of coal were carbonized. The quantity of gas made was 494,579,000 cubic feet, as against 462,658,000 cubic feet in the corresponding half of the previous year; being an increase of 31,921,000 cubic feet, or 6·89 per cent. In the concluding paragraph of their report, the Committee stated that they were pleased to say that satisfactory progress continued to be made with the extension of the Aylestone Road works. No. 3 gasholder was put to work in November last, and had been of material assistance in maintaining an efficient supply of gas during the winter months. The purifying apparatus was well advanced; and it was hoped to have the carbonizing plant at work towards the end of the autumn.

Mr. Lennard, in moving the adoption of the financial statement, remarked that the profit for the past year was the largest amount (but not the largest return upon the money they had in the works) submitted to the Council since they acquired the property. In 1883 Alderman Bennett presented a balance-sheet with a similar amount of profit on a far less capital than now. The present total profit was a handsome one; but it was only 8·84 per cent. on the total capital involved, and considering the large and risky nature of the business, he did not think it was too large a return. Dealing with the way in which the profit had been made, he pointed out that the expenditure on coal for the half year was £25,000 odd—an increase on the previous half year of £4095. They entered into their contracts for coal last May, and had to pay something like £10,000 more for coal for the year, half of which went into the balance-sheet last year. For purifying labour and material, they put down £1045. This did not represent the total amount expended in purifying, but the balance of expenditure over income on the purifying material used in the department. As a matter of fact, they had spent something like £2200 in purifying materials, and received about £2100 from the sale of them after they had been used, which left a debit balance of £1045. This was £600 more than in the corresponding period of last year; and he was glad to assure the Council that next year they would increase that amount to £1500 or £1600. They were going to adopt a new method, and a vastly improved method, of extracting the sulphur compounds from the gas, which they believed would remove all cause for complaints. The next large item was that of wages, in which they had an increase over the corresponding period of £618. The Council would be glad to hear that the relations existing between the Gas Committee and their workmen were so cordial and friendly that when the latter asked that their cause might be considered, they received an increase of 6d. a day, amounting to 3s. 6d. a week to the stokers, in addition to a promise of a week's holiday in the year (the wages to be still paid), which meant an increase of £1100 a year to the wages. But as the rise did not take place till last October, very little of it figured in the present balance-sheet. The increase in the sale of gas had been 6·89 per cent., which meant an augmentation of revenue of £3641; and while in many towns the price of gas had been considerably raised, in Leicester they had kept it unaltered. With regard to the rental of meters, which produced £1893—a decrease of £195—he was under a promise that the Committee should seriously consider it; and he asked for a little further patience regarding it, as the Committee were pledged to call a special meeting during the coming month to consider the matter, and to bring it early before the Council. As to the amount obtained from the sale of residuals, they had a very satisfactory account to render. For coke and breeze they had realized £2085 more than in 1888. During 1888 prices averaged about 7s. 6d., but last year they obtained from 10s. 6d. to 11s. 6d.; and as they sold 31,537 tons, this alone yielded £5000 extra for the year. They paid during the year an additional £5000 for coals; and thus they were entirely recouped by the increase on coke. But whilst they paid an increased price for coal during only half the year, they had obtained double the ordinary balance on coke. They bought the coal in May at 11s. a ton, and received it at that price the whole time; whilst to-day it was worth 15s., and all the time they had been able to sell coke upon the market price of coal. This was a fortunate circumstance, but next year they might be caught the reverse way. With regard to tar and ammoniacal liquor, they sold £9879 worth, which was £2868 more than the previous year. The reason for that he attributed to their good works and good working. Their works were described as "model" works; and he believed they had the best management in the country. They commanded the best price in the market for their residuals, because they were always kept up to a high standard; and they had no compensation to pay on the score of quality. They had also had improved prices, especially for pitch; for while last year they realized only from 5s. to 7s. a ton, this year they had received for hard pitch from 10s. to 15s. They made 3500 tons a year of this article, and it gave them something like £1800 increase on that one item alone. Tar had produced, by working it up, £1 16s. 10½d. per ton, after paying for interest and all expenses

connected with the department, in addition to depreciating the machinery 5 per cent. for the half year. Had they sold the tar, even under the improved market rate, they would only have obtained 25s. a ton; the difference on the profit through working the tar up being £3600. The ammoniacal liquor products had brought in £6000 profit during the year; so that the total difference between working up the residuals and selling them off, came to £10,000 for the year. The coal cost on an average 10s. 4d. per ton, and the residuals realized 7s. 10¾d. per ton of coal carbonized, which was equal to 77 per cent. of the original cost. He had not come across a company anywhere which had realized so much as this by 1s. ton, which spoke volumes for the careful handling of the materials used at the Aylestone works. Turning to the general balance-sheet, Mr. Lennard pointed out that they had a debit balance at the bank of £33,306. That had been changed since Christmas to a credit balance of £3000; but while the department was under the statutory necessity of handing over the profits year by year to the Corporation, it was obliged to remain without any working capital whatever. In a few days they would have to hand over the entire profits. They gave a quarter's credit for gas; so that they must from time to time owe a considerable sum to their bankers. He thought the system was wrong by which they were robbed of working capital. The capital account was drawing to an end. They had at Christmas only £33,400 left to draw, of which they had borrowed £20,000 since, leaving only £13,000 more to borrow. Their stock, as accounted for in the general balance-sheet, was taken very low. They might have made it appear better; but it had always been the policy of the Committee to estimate it favourably to themselves. Since the gas-works came into the possession of the Corporation, £224,353 had been handed over to the relief of the rates, in addition to which they had reduced the price of gas from 2s. 10d. to 2s. 4d. per 1000 cubic feet. In conclusion, he said that they had a very large department to manage; and it was his pleasure, on behalf of the Committee, to testify that the Manager (Mr. A. Colson) deserved exceedingly well of the Corporation.

Alderman Bennett seconded the motion, which was unanimously carried.

Mr. Lennard, in proposing that the Committee's recommendation to add £10,000 to the renewal fund be approved, remarked that he wished he could speak as hopefully of the prospects of the future as in past years; but he gave his word that £15,000 was a fair and legitimate estimate of the profits for next year. They did not know what crisis they were about to enter upon in the coal trade; but he trusted there would be no long continued struggle, even if a strike took place. Coal proprietors were talking about an advance of 5s. a ton. If it was as much as this, it would mean £25,000 off their profits next year, because coke would not go up any higher. They were also bound to go on with the Provisional Order empowering them to supply electricity; and £50,000 would have to be laid out on this as an experiment. Altogether he did not like the look of their prospects for the next two or three years. A large portion of the new plant at Aylestone Road replaced the worn-out and obsolete machinery at Belgrave Road; and they were therefore under the necessity of asking for £10,000 for the purpose of renewing the old Belgrave works. They had no adequate reserve fund. It was only £5000; and they were not allowed to add anything to it. But they could keep their works in such a thorough state of repair as to make them good value for the capital they were supposed to represent; and that was what the Committee desired to do.

Alderman Bennett having seconded the motion, it was agreed to.

The Water Committee's accounts for the half year ending Dec. 31 last showed that the net profit, after paying interest on the capital, was £6091. Out of this had been paid the sum of £1961, the half-year's amount of sinking fund, leaving a balance of £4940, which, added to the balance of net profit (£5161) for the half year ending June 30, 1889, made a total of £10,102 to be dealt with by the Council at the close of the current financial year. A sum of £1256 had been appropriated from the reserve fund for the redemption of the land-tax on the various properties belonging to the department, and the amount of such fund was thus reduced to £3744. The Committee recommended that £1256, part of the above-named balance, be applied to make the reserve fund up to the maximum authorized by the Act of Parliament (£5000), and that the balance of profit for the year (£8846) be applied for the benefit of the district fund. The quantity of water delivered during the year 1889 within the limits of supply had been 1,162,831,188 gallons; and the average consumption of water per day per head of the population supplied had been 18·10 gallons. This also included the quantity supplied for trade purposes. The number of houses on the books at Dec. 31 was 36,007; giving an estimated population of 180,035, which was an increase at the rate of 4·22 per cent. per annum.

Mr. Coleman, in the absence of the Chairman of the Water Committee (Alderman Wood), moved the adoption of the report. He pointed out that from Christmas, 1887, to Christmas, 1889, there had been an increase in the water-consuming population of nearly 20,000. This had not entailed very much additional outlay, and the profits showed an increase of £2600 on the previous year. The amount they asked should be placed to the reserve fund was to replace a similar amount appropriated for the redemption of the land-tax on the various properties belonging to the department. The Council would be very glad to learn that their Water Bill was making satisfactory progress through Parliament; and that of the three petitions lodged against it, two of the parties—viz., Quorn and Messrs. Wright and Sons—had been arranged with.

Mr. Hollingworth seconded the motion, which was carried.

Stapleford and Sandiacre Water Supply.—The Company formed for the supply of water to the rapidly-increasing districts of Stapleford and Sandiacre have been executing deep borings for the past six months. They have now found an abundant supply at Sandiacre in the bunter conglomerate; and as the water was under pressure, it has risen within 2 feet of the surface. The water has been pronounced of good quality by an eminent analyst; and it is much softer than that used by manufacturers in the district. It is intended to carry out the works at once in accordance with the plans of the Engineer, Mr. W. Radford, C.E., of Nottingham.

THE PROPOSED TRANSFER OF THE CARDIFF GAS-WORKS TO THE TOWN COUNCIL.

The Terms of the Corporation.

At the Monthly Meeting of the Cardiff County Council on Monday of last week, Mr. Vaughan moved the adoption of the minutes of the Lighting and Electrical Committee, in which, with reference to the negotiations pending between the Corporation and the Gas Company for the transfer of the gas undertaking, they recommended the Corporation to offer the following terms to the Company:—"(1) Twenty-seven years' purchase upon the maximum amount of dividends paid by the Company during the year 1889, amounting to £16,450. (2) That the Company should reserve to themselves the amount placed to the credit of the reserve fund—viz., £15,403 for compensation, &c. (3) That the Corporation shall pay the amount now owing upon capital, &c.—viz., £44,387. (4) That upon the completion of the purchase, the Corporation shall take over the stock-in-trade and materials as a going concern at a valuation. (5) That in the event of the Local Government Board refusing, or putting such objections or obstruction in the way of the Corporation purchasing the gas undertaking under the powers of the Public Health Act, 1875, that the Corporation will take measures for obtaining an Act of Parliament to enable them to complete the purchase during the next session of Parliament, and in the latter case the purchase shall be completed within twelve months after the Bill has received the Royal Assent. (6) That the undertaking shall be carried on for the benefit of the Corporation, as and from the 31st day of December, 1889, subject to the payment of the maximum dividends by the Directors up to the time of the completion of the purchase. (7) The Directors of the Gas Company and their officials and solicitors shall in all things, at the expense of the Company, assist the Corporation in obtaining the consent of the Local Government Board, or carrying the Bill through Parliament. (8) In the event of the Local Government Board agreeing to the purchase by the Corporation under the powers of the Public Health Act, 1875, then the Corporation shall be at liberty to complete and settle the purchase at any time within twelve months after the formal consent of the Local Government Board has been given thereto. (9) That the Directors shall carry on the undertaking until the completion of the purchase; being paid for their services the same sum as was paid to them during the year 1889." Mr. Vaughan said that some of the members might consider 27 years' purchase a great deal; but he thought, after they had obtained all the information possible, they would find that the Corporation could not do better than accept the terms recommended for their approval. There was no desire to rush this matter through; and it was proposed to call the General Purposes Committee together, in order to give an opportunity for a full debate on the subject. Mr. Trounce seconded the motion, which was carried.

GAS *V.* ELECTRICITY FOR PUBLIC LIGHTING.

Street Lighting in Paddington.

Our readers are probably aware that one of the applications for Provisional Orders for electric lighting now before the Board of Trade has reference to the parish of Paddington, in which the House-to-House Electric Light Supply Company are desirous of expending something like £85,000 in the establishment of works and plant. In view of this fact, and of the general interest in the subject of street lighting which the possible adoption of the new illuminant for this purpose has aroused in the district, the *Paddington and West London Mercury* has lately been devoting a series of articles to the question. As these productions are much above the average of local newspaper articles on technical matters, a few particulars may be usefully extracted.

The writer deals first with the present system of public lighting, as set forth in the last published report of the Vestry. According to that document, the total length of roadways under the Vestry's maintenance is 49 miles 6 furlongs 198 yards—in other words, 87,758 yards. The lamps are placed at an average interval of about 45 yards; and the number of the ordinary lamps in use on March 25, 1889, was 1982. The burner is placed 11 feet above the pavement; and the effective power of each lamp is 13 candles. Each lamp is alight for an average of 10½ hours every night, taking the year round, and consumes per hour nearly 4⅞ cubic feet of gas. The quantity of gas used is determined by meter; and the estimated average consumption for each lamp is 17,787 cubic feet per annum. Before the meter system was introduced, the gas was supplied per hour by contract on a fixed scale; and the estimated saving for the last financial year following the introduction of that system throughout the parish was 6½ million feet. Three kinds of large lamps are used on the refuges—viz., Sugg's 100-candle, Bray's 80-candle, and Sugg's "York," or 35-candle. The writer points out the utility of these high-power lamps, placed as they are where the foot traffic becomes most imperilled, or where the roads are of extra width. The consumption of gas, however, is proportionately much less than by the ordinary lamps; as in the case of the "York" lamp it is 8 cubic feet per hour, with a light equal to 35 candles, against the 4⅞ cubic feet burnt by the ordinary lamp of 13-candle power. The cost of the present system of lighting divides itself under two heads—gas supplied, and expense of maintenance. The gas is sold to the parish at the rate of 2s. 2d. per 1000 cubic feet, or about 38s. 6½d. per annum for each ordinary lamp. The cost of maintenance was about £2350 for the year ending Lady-day last year, or nearly 24s. each lamp. The total cost, therefore, of each lamp is about £3 2s. per annum.

The writer next proceeds to explain how light is measured, and to discuss the principles of its reflection, refraction, and diffusion. In the latter connection, he states that if the distance from a lamp-post to the opposite side of a street, where there is usually no lamp, is 40 feet, the law of equal diffusion would indicate that the distance between two lamps should only be 80 feet, if the street is to be no darker in the direction of its length than it is in its width. He then

goes on to show that besides the question of economy, which must always be kept in view, there are three considerations of practical utility which must form the basis of any system of street lighting. These are: (1) That the light should be sufficient in quantity; (2) that it should be uniformly distributed; and (3) that, more especially in populous districts, it should cover the whole area to be lighted. With regard to the last of these considerations, he thinks it must be recognized that the street lighting of towns is not, under the conditions of our modern life, a luxury—it is a necessity. He illustrates this by pointing to the Whitechapel horrors, which naturally aroused a feeling of insecurity in the neighbourhood, due in no slight degree to the ill-lighted condition of the streets. Notwithstanding such painful exceptions as this, there can be no question that town and city life is much more secure than it was at the beginning of the century, and that this is due to the better lighting of the streets rendered practicable by the introduction of gas. But the writer recognizes, as we have often pointed out in the JOURNAL, that to obtain this result, it is necessary to light not only the main thoroughfares, but also the back streets, the courts and alleys, and the mews. The traffic and its accompanying dangers make it necessary to give more light in the main thoroughfares; but it should never be forgotten that every street and court ought to be sufficiently lighted, in the interests of public safety. But what is "sufficiently lighted?" That is the important question for the parishioners and their representatives. Sufficient light, well diffused, not a redundancy of concentrated light, is the *desideratum* for public lighting. It has been already stated that the ordinary street lamps in Paddington, which are of 13-candle power, are placed at distances of about 45 yards apart. As the light of one lamp shines towards, and meets that of the next, it is obvious that the distance at which the light must be calculated is half the space between the two lights—viz., 22½ yards, or 67½ feet. It is also obvious that at this point the two equal lights blend into one another, so that the light from each need only be half that which would be required were there no other lamps beyond. Now by the law which applies to the diminution of light in proportion to distance, in order to afford half the light given by a standard candle at the distance of 5 feet, the same candle must be placed at the distance of about 7 feet. Therefore, if the lamp-posts are at the same distance apart as now, of what power should the burners be to make the light midway between the lamps equal to the light of a sperm candle at 5 feet? The answer in candle power is that it should equal the square of 67½ divided by the square of 7, or about 93. Consequently, to efficiently light the streets, all the lamps should be raised from 13 to 93 candle power. But to light across the street (if it were 40 feet wide) would require only 44-candle power. It would therefore be most economical to reduce the power of the light to (say) 80 candles, and to use reflectors to reinforce the light in the direction only of the length of the street; for a little consideration will show that the practical uniformity of the light is of almost equal consequence with its sufficiency.

Having considered the existing system of lighting and its cost, the laws observable in the science of light and the application of those laws to the special case under review, the writer devotes his final article to a discussion of the merits of gas and electricity as illuminants. He remarks that, assuming the position of the lamp-posts to be as at present, it would be necessary, in order to give an effective light to the streets, that the power of each burner should be increased fully sixfold. As already shown, each of the ordinary parish lamps, burning on an average 10½ hours per night, consumes about 17,787 cubic feet of gas per annum, which costs, for gas alone, about 38s. 6½d. If no better lighting effect could be obtained from a similar quantity of gas, to raise the light six times, the present amount would cost, for the 1982 parish lamps, in round figures £23,000 per annum. In other words, the lighting rate, which is now a small fraction under 1d. in the pound, would be rather more than 2½d. in the pound for each half year. Such an increase would naturally provoke much opposition, which would be right enough, unless an urgent necessity could be proved. But there are lamps already in the parish which, in their consumption of gas, are much more economical than the ordinary lamps. The latter give 13-candle light for a consumption of 4⅜ cubic feet per hour; but suitable burners could be obtained which would give 80-candle light for a consumption of only about 18 cubic feet per hour—that is, six times the light with less than four times the consumption of gas. The annual gas bill would therefore be something like £15,000 in place of £23,000; and the half-yearly rate 1⅞d., instead of 2½d. But what is to be said for the electric light? Taking arc lamps, the writer considers they should be placed 150 yards apart, and the light be 25 feet above the pavement. Working this out on the same principle as that upon which the requisite power of the gas-lamps was arrived at, it is found that, to obtain the same light between two arc lamps as that given by a standard candle at a distance of 5 feet, each lamp must be at least of the effective power of 1000 candles. But it has been already shown that 80-candle lights, with reflectors, give the some light if placed 45 yards apart. In other words, with better distribution, 267 candles will do the work of the 1000. The price of the electric light is 8d. per Board of Trade unit—or (say) 6d., when supplied in large quantities—of which it may be assumed that 4d. goes for production; and the effective lighting per unit may be taken at 272 standard candles burning for one hour. The number of hours annually each street lamp is alight is estimated at 3866; and a light of 80 candles is required for each lamp. A simple calculation will show that each lamp would need about 1137 units per annum; and further that these, at 4d. per unit, multiplied by the 1982 lamps in the parish, would exceed £37,500. That is, the cost for the same light supplied by means of electricity would be 2½ times that of gas, and require a rate of 4d., instead of 1⅞d., in the half year. If the system of large and powerful arc lamps at greater distances were adopted, the cost would, for equal light, be still further increased. On the other hand, with the introduction of the electric light for private purposes, the price of gas would be reduced; so that the anticipated rate of 1⅞d. per half year might possibly be brought down to 1¼d., or even ¾d. in the pound above the present lighting rate. This small half-yearly addition to the rate would provide throughout the streets of Paddington a light as great as, and more effective, because more uniform than that of electricity. The writer comes to the conclusion, from the foregoing considerations, that electric lighting for the public streets will be out of the question for some time to come. "The continuous improvement in the appliances for the use of gas renders it difficult," he says, "to anticipate the time when, except where a very cheap power is obtainable, or the price of coal is very high, gas will cease to be at once the cheapest and the best illuminant of the streets."

THE ELECTRIC LIGHT QUESTION AT LEAMINGTON.

An animated debate took place at the meeting of the Leamington Town Council, yesterday week, on the report presented by a deputation appointed to make inquiries concerning the working of electric light installations in London. The document stated that the deputation had inspected the lighting arrangements of the National Liberal Club, where there were 700 lamps of 16-candle power each, costing £1 per lamp per annum, or 2d. per unit. They were also taken over the works at Paddington Station, designed and carried out by Mr. Gordon. In that gentleman's opinion, a great reduction would take place in the cost of arc lamps before long; and lamps now costing £14 would be obtained for one-fourth of that price and equally good. The deputation were of opinion that the street electric lamp used in Leamington, and which was only of 16-candle power, would be good if the lamps were kept properly clean, and more frequently renewed. Looking at the great development taking place in electric lighting, and knowing that the best electricians were engaged in making further improvements, and that corporations could obtain Provisional Orders at much less cost than public companies, the deputation recommended that the Council apply for an Order to enable them either to carry out works of their own or to license a company with whom they would be able to arrange suitable terms. Mr. Crowther Davies complained that such a voluminous document had only been placed in the hands of members two hours before the Council met; adding that it did not much matter, however, as there was nothing in it. Alderman Wackrill, Chairman of the Watch Committee, moved the adoption of the report, and explained its principal provisions. He strongly urged the Council to protect themselves by obtaining a Provisional Order, and engaging the services of a skilled electrician. The Mayor (Mr. Fell) said that the report was approved by himself and Alderman Gilbert, who with Alderman Wackrill formed the deputation. Mr. Crowther Davies said the deputation had not been asked to prepare, as they had done, a dissertation on indoor electric lighting. There was a kind of shadowy intimation running through the report that the arc light was better than incandescent lamps for street lighting; but there was no necessity for the deputation to have gone to London to find out that fact. He wished to know whether the deputation favoured the utilization of the present installation, because, if so, it would entail an enormous expenditure with only a problematical result. In his opinion it was preferable to light the Parade with Sugg's or Bray's lamps, and abandon what professed to be an illuminant, but was not so in reality. Mr. Bright thanked the deputation for the trouble they had taken, and said that arc lights could now be made at one-fourth of the cost at which they were produced two months ago. He strongly advised the Corporation to adopt the report, and apply for an Order. Ultimately the report was adopted.

Serious Leakage at the Rivington Aqueduct of the Liverpool Corporation.—It was reported, at the meeting of the Water Committee of the Liverpool Corporation yesterday week, that, owing to a leakage at the Rivington aqueduct, it would be necessary to turn off the supply of water in the city from 6 p.m. to 6 a.m. during the whole week.

Gas and Electric Lighting at Rochdale.—At the meeting of the Rochdale Town Council last Thursday week, the Gas Committee presented a report from which it appeared that, in view of the proposed alterations and extensions of the gas-works, it had been decided to visit towns where works have recently been erected, with the object of seeing the most modern appliances for the making and distribution of gas. From a statement by Mr. Alderman Petrie, it appeared that the House-to-House Electric Light Supply Company, Limited, had been in communication with him as Chairman of the Gas Committee, with a view to arriving at some compromise, and prevent the Corporation's opposition to the Company's application for a Provisional Order. The Committee, however, declined to listen to any terms. "What the Company want," added Mr. Alderman Petrie, "is to get a standing in the town; and what the Corporation want is to keep the matter in their own hands."

Pontefract New Water-Works Scheme.—Towards the close of last year, we recorded the unfortunate subsidence which occurred on the site (at Roall) of the new water-works which the Pontefract Corporation were contemplating constructing for the better supply of the borough. It will be remembered that a well had been sunk to the depth of 107 feet, and a considerable sum had been expended, when the accident took place. The Corporation were then confronted with the question whether the site should be abandoned, or other wells proceeded with. The Corporation were informed that what had been done could be made secure; but the cost would be as great as that incurred in sinking a second well. Before any fresh sinking operations were undertaken, the Engineer (Mr. Hodson) suggested the testing of the rock by the boring of five holes. These holes have in the past two months been made, one going to the depth of 120 feet, and the other four to the depth of 60 feet each, with the result that the rock has been found to be "good and solid." The Water Committee, however, hesitated to proceed further until they put themselves into communication with the Local Government Board, who had conditionally sanctioned a loan of about £23,000 for the scheme. The Committee invited the Board to send down an Inspector to Pontefract and report upon the site at Roall. The request was complied with on the 6th inst., when Colonel W. Ducat, R.E., one of their Inspectors, visited the ground. The Committee, acting on the advice given them, now intend to sink another well in the centre of the land where the borings have lately been carried out. This idea was put before Colonel Ducat, who, it is said, found no fault with the suggestion.

THE WARRINGTON CORPORATION AND THE WATER-WORKS.

A Meeting of the ratepayers of Warrington was held a few weeks since, under the presidency of the Mayor (Mr. Alderman Francomb), to consider resolutions relating to the proposed Bill for the extension of the borough and the purchase of the undertaking of the Warrington Water Company. In referring to the last-named matter, his Worship explained that it had been under consideration for something like 20 years. Since the present Bill was drafted, negotiations had been entered into with the Company; and the Corporation had agreed to strike out the clauses providing for the compulsory purchase of the works. The terms settled were based upon the actual revenue as shown in the Company's balance-sheet; and assuming that Parliament allowed 60 years for the repayment of the purchase-money, and that the revenue did not increase, there would be a charge on the borough rates of 3½d. in the pound. If, however, the increase was at the same rate as in the past three years, this charge would be only 2d. in the first year, 1½d. in the second year, ½d. in the third year, and then it would disappear. If Parliament consented to the suspension of the sinking fund, there would be no charge whatever on the rates. Referring to the advantage which would accrue to the borough from the possession of the water-works by the Corporation, he stated that one of them was that they would be able, if necessary, to obtain 2 million gallons per day of the excellent water which Liverpool was drawing from Lake Vyrnwy. This would cost them 5d. per 1000 gallons; and at this rate even for domestic purposes the Corporation would make a profit. Mr. Alderman Burgess, speaking in support of the scheme, said the increase in the net income of the Company during the year 1889 over the year 1888 was £698, and the increase during each of the last three years had been as follows:—1887 over 1886, £721; 1888 over 1887, £210; 1889 over 1888, £698; 1889 over 1886, £1629. An arrangement which would be even more advantageous to the Corporation, without prejudice to the interests of the Company, would be to grant terminable annuities for 60 years in respect of the £240,750 purchase-money of the dividends. In this case there would be a simple annual payment of a part of the sum of £10,639 10s. for 60 years direct to the shareholders of the Company, instead of to a sinking fund. They had before them a plan which, if adopted, would only entail a charge upon the rate of a minimum of ¼d., or would be lost sight of altogether. The works would, in time, become a source of revenue. Mr. F. Monks, a member of the Corporation, objected to the proposal, on the grounds that the sum asked was too large, and that there had not been sufficient time to consider the matter. The Town Clerk remarked that already between £1000 and £1200 had been spent in connection with the Bill; and a delay of another year would mean that they would have to pay a great deal more for the works. Mr. Alderman Harrison said that, after trying unsuccessfully to negotiate with the Company on the basis of a 27 years' purchase and a 28 years' purchase on their maximum dividend, they were plainly told by the Managing Committee that they could not entertain the offer—that the works were not, in fact, on sale, as they did not wish to part with their property. They offered 30 years' purchase on the Company's maximum dividends of 10 per cent. on £30,000, 7½ per cent. on £15,000, and 7 per cent. on £30,000, and to take over their preference stock of £40,000, bearing 4½ per cent. per annum, also a mortgage debt of £26,819—or it would be safer to say £30,000, for it fluctuated. Consequently, they would have to borrow £270,750. This they could do at 3¼ per cent., which would cost them about £4780 per annum, towards which they should have the water revenue of £8375, as shown by the accounts for 1889; leaving about £4560 to be a charge on the rates, which would amount to about 8d. in the pound. But, no doubt, as was done in the case of the gas purchase, the payment of the sinking fund would be suspended for three years, which would about equal the interest due from them on the borrowed money, and the increased revenue from water-rents, which would most probably amount to £2000 more than it was for 1889. The payment of interest and the sum added to the sinking fund would be reduced to about 4d. in the pound; and then, if the borough boundary were extended, a considerable increase in the rateable value would still further reduce the charge to 3½d. or 4d. in the pound. This was practically the view they laid before the Council. Other speakers followed; and in the end, the meeting was adjourned.

The proceedings were resumed on the 3rd inst., again under the presidency of the Mayor. As on the previous occasion, the discussion turned mainly upon the proposal to purchase the water-works. Strong opposition was offered to this part of the measure; the price proposed to be paid being condemned as too high, while doubt was expressed as to the continuance of the supply from the Winwick wells. The borough, it was said, was already overburdened with rates; and the results which had followed the purchase of the gas-works were pointed to as an argument against the acquisition of the water-works. On the other hand, it was contended that, with the water supply in their hands, the Corporation would be able to use more water for sanitary purposes, for the baths, and for extinguishing fires. In regard to the Winwick supply, it was believed to be permanent; but if it should fail, the Corporation could exercise the powers given by the Liverpool Act to take 200 million gallons of water a day from Lake Vyrnwy. With respect to the price, the shareholders (who did not wish to sell) had a right to demand as much money as would, by investment elsewhere, yield them the income they now obtained. It was impossible for them to do this unless they received 30 years' purchase for their property. It was further urged that the Corporation must either buy now or never, for the Company had capital to the amount of £80,000 unraised, and if the Directors called up this, or any portion of it, the purchase price would be correspondingly increased. Objection was raised to other portions of the Bill; and when the resolution was put, at the close of a long and animated discussion, it was promptly rejected—only eight or ten voting for it. An informal resolution, expressing the opinion that no engagement for purchase should be entered into until there had been an inspection of the Company's books by some person or persons appointed to act on behalf of the Corporation, and until a report had been obtained from a competent and disinterested water engineer on the Winwick and Appleton supplies, as well as on the general condition and prospects of the undertaking was as cheerfully carried. A poll was demanded; and it is to be taken at the end of the present month—the counting of the papers being fixed for the 1st of April.

The Town Council met on the following day, and was occupied for a long time in the discussion of matters relating to the Bill; the water-works purchase clauses being, as before, the chief bone of contention. Mr. Monks proposed that the matter should be referred back to the General Purposes Committee; arguing that their report was incomplete, and alleging that a debt of £2933 which the Corporation were expected to take over from the Company had not been taken into account. Mr. Platt maintained that the sum which was to be paid to the Water Company for the purchase of their concern was a great deal too much. He contrasted the matter with the negotiations which had gone on between the Douglas (Isle of Man) Improvement Commissioners and the Water Company of that place (*see ante*, p. 403); and pointed out that while Warrington was proposing to allow 30 years' purchase of the maximum dividends, the Douglas Commissioners were to acquire their undertaking for 26½ years' purchase of the *bonâ fide* earnings for the past year. He thought that the Warrington Bill was being rushed through Parliament at a speed which none of them could follow; and considered that the omission from it of any provision for the sinking fund was totally wrong. Mr. Alderman Crosfield also took the view that the price suggested was far beyond the value of the works; and said that while the Company had not put anything in the depreciation fund, some of the mains had been down for 40 years. Mr. Flood characterized the proceedings at the public meetings as "a comedy of errors;" and said that not three members of the Corporation had been able to agree upon any given subject, owing to a want of knowledge of the real facts of the case. Mr. Alderman Burgess, defending the proposed terms of purchase, said the Water Company told them at the outset that their property was not in the market; that they were not sellers, and had no terms to offer. The negotiations resulted in the deputation ascertaining pretty fairly what the terms would be that the Directors would recommend to the shareholders for purchase; and if he were one of the shareholders, the Corporation should not have the works for a half-penny less than the amount which had been stated. The Council might depend upon it that the present was their opportunity; and he had not heard anything said that night which changed the opinion he had formed that this was the opportunity which, if missed, Warrington would regret hereafter. Mr. Shaw Green (who is an officer of the Company) said he was thoroughly familiar with the accounts of the undertaking; and if he could be one of 20 who could purchase the water-works on the terms at which the Corporation had the chance of buying them, he would raise every farthing he could, by loan or in any other way, to find his share of the purchase-money. Mr. Voisey and Mr. Alderman Harrison also spoke in favour of the purchase. Mr. Bolton was addressing the Council in opposition to the scheme, when attention was directed to the fact that there was not a quorum; and the proceedings were brought to an abrupt conclusion without a vote being taken.

PROPOSED PURCHASE OF THE MAIDSTONE WATER-WORKS BY THE LOCAL BOARD.

At the Meeting of the Maidstone Local Board last Wednesday week, Mr. Cox, in accordance with notice, moved—"That this Board apply to the Local Government Board for power to acquire the works of the Maidstone Water Company." He did not think there would be any dispute as to whether a monopoly of this kind could not be managed for the benefit of the ratepayers. He believed if the Board acquired the works, landlords and tenants would mutually benefit; and the more water supplied, the more would the rate be reduced. He did not think the surplus of the profit should go to the idle investor, but should be returned to the consumer for his benefit in the reduction of the rates. If the concern had been taken over ten or fifteen years ago, it would have saved the town £15,000 at least; and if it were not acquired for another ten or fifteen years, it would cost them a like sum more. The money required for the purchase could be borrowed at 3 per cent. The water-rental would pay for this annual expenditure; and in the course of 30 years, the works would be the free property of the ratepayers. The Mayor (Mr. J. Clifford) suggested that the motion should be altered as follows:—"That a Committee be appointed to take into consideration the advisability of applying to the Local Government Board for powers to acquire the works of the Maidstone Water Company." To this Mr. Cox assented; and Mr. Anscombe then seconded the resolution—remarking that he was sorry it did not include the Gas Company's Works. The motion was adopted; and a Committee was immediately appointed.

Sale of Shares.—At the Mart, Tokenhouse Yard, recently, Mr. Walter Hall sold by auction one-fourteenth part of a share in the King's Moiety of the New River Company. The stock was divided into 7 lots, each consisting of one ninety-eighth part of a King's share. Of these, 2 lots sold for £1000 each; and the other 5 realized £980 each.

The Collapse of the Negotiations to Purchase the Canterbury Gas and Water Works by the Corporation.—At the meeting of the Canterbury General Purposes Committee last Wednesday, a letter was read from Mr. James Burch, the Secretary of the Gas and Water Company, which was accompanied by a copy of a resolution recently passed by the Directors on the subject of the proposed transfer of the property they control. It was as follows:—"Resolved that the Directors regret to learn that the Town Council are now no longer unanimous in their desire to purchase the gas and water undertakings at a price to be fixed by reference, and are unable to secure the necessary statutory majority to carry out the previous resolution they unanimously passed. That as the same difficulty of securing a statutory majority will probably arise in any further negotiations which the Council suggest the Company should open, it appears useless to the Directors to open any such negotiations." The Committee decided not to take any further steps in the matter.

THE INQUIRY AT SHEFFIELD INTO LEAD-POISONING BY THE WATER SUPPLY.

The Commission appointed by the Sheffield Corporation to investigate the prevalence of lead-poisoning in the borough and surrounding districts, and the best remedy for the same, have held their inquiry. Before, however, noticing the proceedings, a summary may be given of part of the correspondence on the subject which has been addressed to the Chairman of the Water Committee (Mr. Alderman Gainsford).

One letter—from Mr. Stuart Uttley—expressed the opinion that lead-poisoning may have something to do with the cheap tea which is sold at shops where the customers receive presents. Two other letters were from medical men, one at Handsworth Woodhouse and the other at Woodhouse. Both these villages are supplied with Redmires water; yet, singular to say, no cases of lead-poisoning from water have made their appearance there. This leads Mr. Henry Pillow, of Handsworth Woodhouse, "to doubt the accuracy of the reports concerning the prevalence of lead-poisoning in Sheffield." Mr. A. W. Scott, of Woodhouse, does not doubt the existence of lead-poisoning; but he suggests that perhaps the action of the water on lead is weakened in its passage through the cast-iron pipes to his district, and that this may account for there being no lead-poisoning at Woodhouse. The Managing Director of the International Water and Sewage Purification Company, Limited, writes that he can supply a material which will not only remove the solvent action of water on lead, but "remove from the water any lead that may have been dissolved in it." The material is known as "Polarite." The Manager of the Revolving Purifier Company writes respecting their apparatus; and says he is "confident the revolving purifiers, if adopted for treating the Redmires water, would completely rectify the present evil in an economical manner, without introducing chemicals or otherwise detracting from the water." So confident is this Company of the success of their system, that they offer to lend a complete apparatus for three months which would be capable of treating from 50,000 to 60,000 gallons per day.

At the opening of the inquiry on Wednesday, the 19th ult., the whole of the members of the Commission were present—Mr. C. Hawksley, C.E., Consulting Engineer to the Water Department; Mr. E. M. Eaton, Resident Engineer and General Manager; Professor Dewar, of the London University; and Dr. Bristowe, of London. Alderman Gainsford presided; and before inviting evidence, he made a few remarks, pointing out the various branches into which the inquiry would naturally divide itself. In the first place they wished to ascertain the true facts in Sheffield with regard to the subject of lead-poisoning. He was not going to question for a moment that the water from the Redmires reservoirs was undoubtedly of such a character, from some cause or other, as to be liable to take up lead freely. This being assumed, the question arose, what were the actual results from this state of things? None of them, he thought, would wish to deny that there was lead-poisoning in Sheffield—lead-poisoning resulting in some cases possibly from drinking the water; but it would be necessary to go very minutely into as many cases as possible, not so much for the purpose of satisfying themselves as to the existence of poisoning by lead, as to ascertain its extent. They wanted to find out whether lead-poisoning in Sheffield was a great evil—a very serious matter, indeed—calling for a remedy at any cost; or was it a matter, of some importance of course, but still not so imperative as that financial considerations might not fairly, and to a large extent, be taken into consideration. Having satisfied themselves upon the true facts, the next point was what were the causes of this lead-poisoning. The third question related to the remedies that ought to be applied. On behalf of the Water Committee, he heartily thanked the medical profession—both individually and collectively—for the assistance they had given. Alderman Clegg was the first witness; and he stated that there was no doubt Sheffield was peculiarly liable to plumbism from other causes than water. There was a good deal of working in lead—file cutters, file hardeners, and others who used lead very extensively. Dr. Thomson, the Medical Officer of Health, averred that since his appointment in 1887, he had personally seen several cases of lead-poisoning, and other medical gentlemen had written to him expressing the opinion that there was lead-poisoning in the borough, due to the water supply. Two of the cases were those of a mother and daughter, the latter of whom died. The water supplied to the house was analyzed. There was lead in it to the amount of 0·4 grain per gallon in one sample, and 0·05 grain per gallon in the other; the first sample being water which had been standing an hour in the pipes, and the other water taken after the tap had been running. A second analysis was made, which showed 2·5 grains per gallon when the water had been standing, and 0·1 grain when the standing water had been drawn off. The Chairman incidentally observed that in three annual reports to the Health Committee, 27 cases of death from plumbism were reported, 24 being males and three females; and it was part of their duty to investigate the causes of these deaths. In further examination, Dr. Thomson said that in 1889 there were six deaths from lead-poisoning, of which five were certainly due to trades. The other was the case of the girl already referred to. Of 16 in 1888, ten certainly might be taken to be due to trades. He believed that lead-poisoning from water existed to such an extent as to constitute a serious evil to the health of the community; and he considered the matter ought to be set right. He personally inquired into the history of between 20 and 30 cases in 1888; and in almost all of them, he satisfied himself that the patients were suffering from lead-poisoning arising from the water supply. Questioned by Mr. Hawksley, Mr. Eaton said that the Redmires water was supplied to about 120,000 persons. Dr. Keeling was next called, and said he had met with two cases of lead-poisoning in his own practice, but no deaths. Both these he attributed to the contamination of the drinking water in the houses in which the persons lived. Through the courtesy of friends, he had seen several instances in the last few days, some of which he was satisfied were decided cases of lead-poisoning due to drinking water. He was under the impression that the bulk of the lead-poisoning cases occurred among the working classes in certain parts of the town; but was convinced in his own mind that there had been a good deal of exaggeration, and that a number of the symptoms had been put down to lead-poisoning simply because there was a certain line of blueness on the gums, which was not always a sign of lead-poisoning. Undoubtedly there was lead-poisoning to an extent that was provable and dangerous. He was of opinion that nothing short of the absolute exclusion of lead from the drinking water would answer. He did not think they could stop at any half measures; they must make the remedy absolute. Dr. Dyson deposed to having had a great many cases, including some in which he thought plumbism accelerated death; and he named instances which were all in the high-level district of supply. He did not regard filters as a good permanent remedy. Two patients he had seen had gone blind from lead-poisoning; and this was, he thought, serious. The Committee should take reasonable measures to cure the evil. He had seen a list of 129 cases published in a local paper; but he could not enlighten the Committee about them. Since Oct. 1, he had had over twenty cases in his consulting-rooms; and he found he had been into 80 streets where there were cases of the kind. Mr. Pye-Smith, a surgeon, mentioned a large number of cases that had come under his observation, nearly all of which were in the elevated parts of the borough. He advocated that drastic, but not panic, measures should be taken to remedy the evil. Mr. Hawksley pointed out that the amount of water brought into Sheffield was about fifty times the quantity which was drunk. The question naturally arose whether these fifty parts were to be "doctored," in order that one part might be used. Then supposing there was one patient in 1000 of the population who was susceptible to lead-poisoning, that would amount to 50,000 times as much water as was drunk to influence the systems of a few people. That was one of the difficulties of the whole question. Mr. Pye-Smith said he did not see the difficulty; he saw the fact. Dr. Matthews instanced several cases of lead-poisoning, which he had proved, to his own satisfaction, arose from the water supply. Dr. D. S. Porter, who said he had made the subject of lead-poisoning a special study, stated that his notes covered a period of eight years, during which time he had met with 252 cases, of which 169 were attributable to trade, and 83 to water, in default of any other apparent cause. In a very large proportion of cases, he had ascertained that unfiltered water was drunk. He did not think, if lead pipes and cisterns were done away with, even if the Water Committee were to agree to pay part of the cost of the renewal of the fittings, it would meet the case.

The inquiry was concluded the next day. Evidence was first given by Mr. A. Jackson, a surgeon, who stated that he had not seen a single case of lead-poisoning from water-drinking for the last five years; and he did not believe it prevailed to any serious extent. He was not of opinion that the Redmires water, as at present distributed through lead pipes, constituted a serious danger to the health of the community. In his opinion, there was not enough proved to justify very large expenditure on what was very much experimental. Before water was run through lime, someone who knew more than witness did on the subject, ought to say what would be the consequences. Dr. Sinclair White, who was Medical Officer in the borough from February, 1885, to October, 1887, was next examined. In January, 1886, he reported to the Health Committee the existence of the danger of lead-poisoning by the water supply; and they instructed him to make a thorough examination into the matter. From his investigations, it soon become evident that the action of water on lead was confined entirely to the Redmires district; that the action of the water on lead pipes was due to the presence of a free acid; and that this acid was imparted to the water in the moorlands over which it came. The action of the water on lead pipes appeared to him to be always in direct proportion to the acidity of the water. When the acid was got rid of, the water would cease to act on lead. His recommendation was that the Redmires water should be brought in contact with Derbyshire limestone, broken into small fragments, for the space of 15 minutes before distribution. The water should be tested frequently; and if after a time the protective influence excited by the limestone was diminished, the fragments of limestone should either be renewed or have their surface renovated. He believed the action of the Redmires water on lead pipes constituted a serious danger to the health of the community; that it had produced a large number of cases of lead-poisoning; that it had caused death in several instances; that it had caused blindness in at least two or three cases; and that it had caused a very large amount of indefinite ailments. Mr. Hawksley inquired whether, supposing a filter-bed was made with sand in it to take out the suspended matter, and beneath that a foot or 6 inches of broken limestone, so that the water would come into contact with it, not for fifteen minutes but for an hour, would it answer the purpose. Witness replied in the affirmative. He also approved of a regulation being made, forbidding the use of lead-lined cisterns. Dr. Burgess testified to various cases of lead-poisoning having come under his cognizance, which were clearly traceable to the water supply. The Borough Analyst (Mr. Alfred H. Allen) was next called; and he read a very elaborate statement which he had prepared, and at the end of which were the following conclusions at which he had arrived:—"(1) A part of the Sheffield water supply has at times a powerful action on lead pipes and cisterns. (2) There are, or have been recently, numerous authenticated cases of lead-poisoning in Sheffield which can be definitely traced to the use of lead-contaminated water. (3) That the lead poisoning is almost or is wholly confined to the high-level or Redmires supply. (4) Chemical analysis shows the presence of dangerous amounts of lead in the water which has been delivered through leaden pipes connected with the high-level system, especially after standing in the pipes all night; but there is usually little or no lead to be found in the water coming through lead pipes from the low-level supply. (5) The proportion of silica found by Dr. Tidy in the high-level water is practically the same as that in the low-level supply. (6) The high-level water (Redmires) contains a notable quantity of free acid of vegetable origin; whereas in the low-level water the acid exists in a combined or neutralized state. (7) Artificial neutralization of free acid present in the high-level water would in all probability destroy or greatly reduce the tendency of the water to act on lead. (8) Neutralization could be effected by adding carbonate of soda to the water at a probable cost for chemicals of £1000 per annum. (9) Neutralization could be effected by the addition of a small quantity of lime to the water; 20 or 30 tons per annum would probably be sufficient, though a supplementary filtration through sand might be found necessary. (10) Lead corrosion might be prevented

by bringing the water in contact with limestone, preferably in a horizontal cylinder kept in revolution by water power. The first cost of the apparatus would be considerable, but that of the limestone insignificant. The treatment might have to be supplemented by a simple filtration through sand. (11) The same revolving apparatus would be suitable for treating the water with any other purifying agent, such, for instance, as a mixture of flints and lime, or with metallic iron. Encouraging results have been obtained with the latter material. (12) Filtration of the water through beds of mixed flints and limestone would cost £10,000. But they afford only a temporary remedy; for the limestone would speedily become coated with peaty matter, and thus be rendered inert, while the expense of removal or restoration of the filtering materials to an active condition would be very considerable. (13) Any method involving the use of lime or limestone would only increase the hardness of the water to a very insignificant extent, not appreciable by the ordinary consumer. Any method involving filtration through sand would materially improve the colour and appearance of the water; and the same is true of most other processes." Two other witnesses—Mr. G. K. Thorpe and Mr. J. Benson—also gave evidence as to the existence of lead-poisoning.

This concluded the evidence; and the Chairman asked the witnesses and the representatives of the press to retire while the Committee deliberated. After an absence of about half an hour, they were readmitted. The Chairman said that the Special Committee had arrived at a preliminary report for presentation to the Water Committee; and the Sub-Committee considered it should be immediately published. It was as follows:—"Your Sub-Committee, including the professional gentlemen who have been called in to assist them, having heard and carefully considered the important medical, chemical, and other evidence that has been placed before them, unanimously find (1) That such of the inhabitants of Sheffield as use Redmires water for drinking purposes are liable to be injuriously affected by the presence of lead therein, as derived from the pipes and cisterns of the consumers; (2) That by way of practical experiment, and pending a further and more complete investigation of the subject, and with the view to immediately preventing the action which the Redmires water exercises upon lead pipes and cisterns, a small but sufficient quantity of chalk, in a state of minute division, which will not in your Sub-Committee's judgment prejudicially affect the water for domestic or manufacturing purposes, be added to the water at or near Redmires, before its distribution in the town; (3) That further time be taken before the presentation of a complete report."

This terminated the inquiry.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 15.

Sulphate of Ammonia.—Whatever may be said to the contrary, good makes continue to sell freely at £11 17s. 6d. f.o.b. Hull; and were the market not kept in check by the speculators, who apparently have still heavy requirements to cover in, an improvement might be more readily relied upon. It is an undeniable fact that the absorption of the orders by these operators has greatly hampered business. From shipments and deliveries generally, it is very plain that the demand all round has been quite equal to former years; and that the drawbacks those connected with the trade have been suffering from, are due to the business having been absorbed in speculative channels. It is anticipated that there will be some large requirements yet before the close of the month; and makers, by selling as heretofore with circumspection, will find themselves quite able to maintain the present range of values. Somewhat lower prices are quoted at Liverpool; and this will probably continue to be the case while the strike of the dock labourers lasts. From Scotland, business is reported at £11 15s. prompt and forward. Nitrate is rather quiet; but a further decline now seems unlikely.

LONDON, *March* 15.

Tar Products.—Benzols continue to recede in value; and anthracene, as well as carbolic, is quoted lower. Pitch is undoubtedly more inquired about; and as the shipping season is now drawing to a close, buyers are more anxious to cover their requirements. Stocks of this article are remarkably low; and makers are easy about the future. Common oils are in good request; but in many instances are quotable lower. To-day's prices may be taken as follows:—Pitch, 27s. to 32s. 6d. per ton, according to position. Tar, 25s. to 31s. 6d. per ton, according to position. Benzols, 90 per cent., 3s. 8d. per gallon; 50 per cent., 2s. 8d. Toluol, 1s. 10d. per gallon. Solvent naphtha, 1s. 8d. per gallon. Crude naphtha, 1s. 2½d. per gallon. Light oil, 4½d. per gallon. Lucigen oil, 3d. per gallon. Ordinary creosote, 2½d. per gallon. Carbolic acid, 2s. 8d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 4½d. per unit; "B" quality, 1s. 1d.

Sulphate of Ammonia.—Dealers are still depressing this market; and some important sales have undoubtedly taken place at lower prices than had been accepted any time before during the season. The low price of nitrate of soda is, at the moment, a depressing factor. Makers are having difficulties with those who bought at higher prices. It is singular that sulphate of ammonia is not generally sold on the actual percentage of NH_3 it contains; and it is unbusinesslike, to say the least, that merchants who buy on a basis of 24 per cent. here—good dry sulphate usually contains 25 per cent.—should get the advantage of this difference in percentage, amounting to 10s. per ton, in selling to foreign buyers. The market value of sulphate to-day is from £11 10s. to £11 13s. 9d., less 3½ per cent., according to position and conditions as to bags and delivery.

The Douglas (Isle of Man) Town Commissioners and the Water-Works.—The Manx Legislature have unanimously passed a Bill empowering the Douglas Town Commissioners to purchase the water-works undertaking, for which, as stated in the JOURNAL a fortnight ago, they had entered into an agreement with the Water Company. It is proposed to unify the existing debt, and raise a loan of £200,000, at a rate not exceeding 3½ per cent., guaranteed by the water and other rates.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

For some reason, which is to me a mystery, the Act of Parliament under which the Edinburgh and Leith Gas Commissioners hold office, enjoins them to hold an annual meeting on the second Wednesday of March, or within ten days thereafter. One unaccustomed to the drafting of parliamentary measures would have thought that a more suitable time for the holding of an annual meeting would be in the month of June or July, when the accounts for the past year could be submitted, and the doings of the Commissioners be a little more fully explained to the public, than at a period of the year when all that pertains to the working of a gas concern is on the wane, and the Commissioners should be busying themselves with the outlook for the coming twelve months. This so-called annual meeting was held yesterday—coming in lieu of the ordinary meeting at the end of the month; and instead of partaking of anything of the "annual" nature, it was even more brief and meaningless than usual. It lasted only six minutes, the business consisting of the already stereotyped form of approving, without comment, of the minutes of Committee meetings, which the members have before them in print. So far as the orderly conducting of business is concerned, nothing could be more regular; but I suspect that the public, if consulted, would like to have something more for their money than the publication of a few bald statistics, or paragraphs from a minute-book, drafted in trim legal phraseology, but conveying only the results which have been arrived at, and none of the reasons for arriving at them. How are the public to judge of who is competent for the post of Commissioner if the rule is that none of the Commissioners open their mouth at all in public? And if there be among them men, as one of their own number has said, who do not know what a retort is, how is such incapacity to be found out if all are reduced to the same silent level? The business yesterday did not differ in any respect from that at an ordinary meeting. There was no attempt to show whether or not the business of the Commission was prospering, or was being well conducted. Nothing was said as to how the proposals to introduce electric lighting would affect the business of the Commission; and though it may be thought by some that on this subject the least said the better, others may have a different opinion. There are two sides to the question; and while the promoters of electric lighting are unceasing in their endeavours to keep their interests before the community, it surely cannot be the best policy for the Commissioners to affect supineness, and allow the citizens to be educated all the other way. The Commissioners are not administering a losing concern, and need not fear, but would rather benefit from, publicity. Even the important additions to the working power of the Edinburgh station were not alluded to, although, considering the amount that has been expended upon them, and the large results which they will achieve, the subject would have formed a suitable theme for the Chairman or the Convener of the Works Committee to have spoken upon. If the Commissioners wish to retain the confidence of the public, they ought to take the public more into their confidence. They are not a body administering a Statute merely; they are charged with the conduct of a business, probably the largest in the district, which comes into touch with the community at more points than perhaps any other which one can think of. They are traders whose object it should be to stand well with their customers; and nothing will remove the good opinion of the public sooner than anything which might give rise to the suspicion that the business of the Commission is being conducted in a hole-and-corner fashion. Admittedly there are many transactions which it would not do to make public until they are completed; but on the other hand there must be many questions of public policy before such a Board in the consideration of which it would be desirable to carry the public along with them. *Laissez faire* is never a good motto for a public body, and least of all for a body conducting such a business as a gas undertaking. Acting under it means allowing the business to drift whichever way the uninformed public may choose to go; discarding it means an intelligent promotion of the business. The experience of those who have tried the latter policy has shown how much may be gained by it. There has been too much of the easy-going method of managing gas businesses; and yet the Edinburgh and Leith Gas Commissioners seem likely to fall into it. Will they not waken up and show unmistakably that they are able to "carry forward" as well as "carry on" their business?

Justification for the above remarks is to be found in the attitude of the Commissioners upon the subject of electric lighting. They had been informed by the Board of Trade, through their Parliamentary Solicitor, of the proposed amendment of the Electric Lighting Acts, referred to in my last week's Notes, which will have the effect of making them the Local Authority under those Acts; and yet, though urged by Bailie Archibald to lay their views upon the proposed change before the authorities at Dover House, the Committee resolved to take no action. The minute of the Committee was adopted without any reason being given for their resolution. Considering that they are the body most interested, this certainly looks like giving away the situation, because there is little doubt that the Electric Lighting Companies will look after their interests at Dover House, as well as elsewhere.

Lord Wellwood in the Court of Session yesterday intimated that, on the ground that there will be a great deal of scientific evidence in the trial of the action by George Mackay and Co., brewers, against the Edinburgh and Leith Gas Commissioners, and a delicate question of law is involved, he will try the action himself without the assistance of a jury. This decision is likely to be brought under the review of the Inner House, as the pursuers seem most anxious to have the case tried by a jury.

A decision was this week given in the Supreme Court which determines authoritatively the method of fixing the valuation of gas and water undertakings. There has hitherto been no decision in Scotland which ruled this question. The last time an attempt was made to settle it was in 1887,* when the Edinburgh Gas Company appealed against the valuation put upon their mains by the magistrates of

* See JOURNAL, Vol. XLIX., p. 499.

Leith. The question which always came to the front was whether public undertakings should be valued upon the revenue under deduction of the cost of collecting it, or upon the cost of the works less depreciation. Lord Lee held that it should be the latter, while Lord Fraser was of opinion it should be the former; and as they always differed, the determination of the Lower Court was, according to the law of Scotland, allowed to stand. It was thus left to assessors and magistrates to choose whichever method they liked. Lord Lee has since been promoted to the Inner House, and Lord Fraser has been removed by death. Their places are taken by Lords Trayner and Wellwood, before whom there were recently argued appeals against the valuations put upon the Kinross and Milnathort, and the Pollokshields Gas Companies. The Kinross and Milnathort Company complained of a valuation of £377 upon their works, and craved that it be reduced to £255, which was 8½ per cent. on the £3000 which the works originally cost. The assessor had fixed the valuation on the balance of income and expenditure, and the Magistrates supported that view. The Pollokshields Company in similar circumstances asked that the valuation of their works should be reduced from £500 to £300. The Court sustained the view which the assessors had taken. Lord Trayner said he regarded it as the best and fairest mode of ascertaining the value of works like those of the appellants. He disapproved altogether of the idea that the value should be fixed by a percentage on the cost. He also disapproved of estimating the value on a mere consideration of their output or productive power. With such a clear decision as this, there should be no more difficulty in determining the value of works.

The Edinburgh and District Water Trust had a conversation on Thursday over the report of their Works Committee upon the proposals for an additional water supply. Nothing new was forthcoming; the prevailing sentiment, given expression to chiefly by Lord Provost Boyd and Bailie Archibald, being that there should be no haste over the matter, but that the fullest information on the subject should be circulated before a decision is come to as to which of the alternative schemes will be adopted. With that view, copies of the Committee's report are to be sent to the members of the corporations within the district; and the public are to be furnished with copies if they call for them at the offices of the Trust. A copy of Mr. Colston's history of the water supply of Edinburgh, which he has written at the request of the Trustees, was laid upon the table; and Lord Provost Boyd complimented the Councillor upon the result of his labours. The history, he had no doubt, would be highly appreciated, as it deserved to be.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

The make of gas at the Glasgow Gas-Works last month was quite phenomenal as regards quantity. It amounted to 335,613,000 cubic feet, as compared with 295,978,000 feet in the corresponding month of last year. These figures show an increase of 39,635,000 feet, or 13·39 per cent., a monthly increase which has never, I believe, in the whole history of the Glasgow gas supply undertaking been equalled. There certainly were some rather foggy days in the early part of the month, the consequence of which was that the daily consumption of gas several times exceeded 13,000,000 cubic feet. Only once during the month did the deliveries fall below 11,000,000 feet, and even on that occasion the "fall" was only 28,000 feet. There is good reason to feel satisfied with the past month's demands on the local gas-works—and be confident that the Corporation gas supply undertaking will yet hold its own, even though there is a very decided growth in the demand for electric light.

While referring to electric lighting, I may mention that a very interesting lecture on the subject was delivered last Monday evening, under the auspices of the Dumbarton Philosophical Society, by Mr. Archibald Denny, of the well-known shipbuilding firm of that town. In the course of his lecture, Mr. Denny said that, on the very important item of cost, the data now accumulated are not extensive or complete, but that in many places electricity is sold at a price which makes it equivalent to gas at 3s. 6d. per 1000 feet; and he expressed his belief that under advantageous circumstances it could be sold at much less than that price. In the course of the latter part of his lecture he had something to say on the dangers of electric lighting. He claimed that, although there was only one death in this country last year from electricity used in lighting, there was more row made over it than over the ninety and nine deaths which occurred from gas and oil-lamps. He said, in conclusion: "I do not come here to pit the electric light against gas. The electric current is the greatest and most useful power we have; and I look forward to the day when we shall have our houses lighted by it, and when all our heat will be derived from coal turned into gas before being used."

I am informed that the tender of Messrs. Hanna, Donald, and Wilson, Gas Engineers, of Paisley, for the construction of a third lift to another of the big gasholders at the Dawsholm Gas-Works, has been accepted by the Glasgow Corporation Gas Committee. If I mistake not, it was the same firm that constructed in the first instance all the three holders at the Dawsholm works. While speaking of contracts, I may mention that there is a probability of the order for the new condensers required for the Tradeston Gas-Works being divided between the Airdrie Iron Company and the Barrowfield Iron-Works Company (formerly Laidlaw, Sons, and Caine). The contract for the roofing and other ironwork required for the new meter-house at the same works has been placed with Messrs. Somerville and Co., of Dalmuir Iron-Works.

At last Monday's monthly meeting of the Johnstone Police Commissioners, it was reported that the question of increased gasholder accommodation had been again under the consideration of the Board sitting as Gas Commissioners, but that little further progress had been made. A Committee had been appointed, however, to see holders in other towns before any definite scheme should be resolved on.

Last Sunday, at his residence in Greenock, the Town Chamberlain and Treasurer of the Municipal Trusts, Mr. Alexander MacKellar, was overtaken by death, after having been in the public service of the town over the long period of forty-three years, during a large portion of which he was most closely identified with the financial department of the Corporation gas supply undertaking.

For the week ending to-day the report on the local sulphate of ammonia market states that the market continues quiet, and the demand for both prompt and forward delivery is limited. The position, so far as prices go, is unchanged. Stocks in makers' hands are not heavy; and one or two middlemen are said to be pretty well committed to a fall in prices during this or next month. It may be incidentally mentioned that the shipments of this commodity from the port of Leith during the month of February amounted to 2383 tons. In the corresponding month of last year, however, they were greater—amounting to 2617 tons.

The pig iron market has been steady during this week. Scotch warrants fluctuated in price between 50s. 2d. per ton cash on Tuesday, and 51s. 8½d. yesterday, while the closing price in the afternoon was 50s. 11d. cash buyers. The trade, as a whole, seems to be a shade steadier; and it is satisfactory to observe that the withdrawals of warrant iron from the public stores continue to be very heavy. This condition of things is likely to continue for some time to come.

The coal trade in the West of Scotland continues fairly active, but the demand for splint and "Hamilton ell" is quieter. House coal is steady, and steam and furnace sorts are well supported. The rates at Glasgow Harbour are about—Splint, 10s. 9d. to 11s. 3d. f.o.b. per ton; main coal, 9s. 9d. to 10s.; steam, 11s. to 11s. 6d.; ell, 10s. 4½d. to 10s. 6d.; Ayrshire coal, 9s. 6d. to 9s. d.; and soft coal 10s. f.o.b. at Ayrshire ports. The Scotch miners generally do not seem to be going in with the strike movement that has in England arrived at such an acute stage.

Electric Lighting at Reading.—The Reading Town Council have recently agreed to consent to an application to the Board of Trade, by the Laing, Wharton, and Down Construction Syndicate, for a Licence to supply electricity within the borough for seven years.

Rejection of the Plymouth Corporation Water Bill by the Ratepayers.—The poll which was demanded at the recent statutory meeting of the ratepayers of Plymouth on the Water Bill of the Corporation (which has for its object, among other things, the construction of a reservoir at Harter) was carried out last week; the result being as follows:—In opposition to the Bill, 6849; in favour, 2569; or a majority of 4280 for the opponents. The Bill will, therefore, be forthwith withdrawn.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

For Stock Market Intelligence, see ante, p. 484.

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p. c.	10	12⅛—13⅜	..	5 11 1
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	109—111	+1	4 10 1
100,000	20	28 Nov.	8	Bahia, Limited	20	20—21	+½	7 12 4
200,000	5	14 Nov.	7½	Bombay, Limited	5	6—6½	..	5 15 4
40,000	5	,,	7½	Do. New	4	4⅞—5⅛	..	5 17 10
380,000	Stck.	27 Feb.	12½	Brentford Consolidated	100	215—220	+2	5 11 4
125,000	,,	,,	9½	Do. New	100	158—163	+3	5 13 6
220,000	20	13 Mar.	11	Brighton & Hove Original	20	40—42*	..	5 4 9
320,000	20	27 Sept.	11½	British	20	45—47	+2	4 15 9
50,000	10	13 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20*	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—14*	..	5 14 3
328,750	10	14 Nov.	10	Buenos Ayres (New) Limited	10	12⅜—13⅜	..	7 8 2
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	105—106	..	5 11 1
150,000	20	27 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	13⅜	Commercial, Old Stock	100	249—254	..	5 8 3
130,000	,,	,,	10⅔	Do. New do.	100	200—210	..	5 2 4
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	118—123	..	3 13 2
557,320	20	12 Dec.	13	Continental Union, Limited	20	46—47	..	5 10 8
242,680	20	,,	13	Do. New '69 & '72	14	31—33	..	5 10 3
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	30 Jan.	13	European, Limited	10	23—25	..	5 4 0
120,000	10	,,	13	Do. New	7½	17⅞—18⅝	..	5 5 3
354,060	10	,,	13	Do. do.	5	11½—12½	..	5 4 0
5,470,620	Stck.	13 Feb.	13⅜	Gaslight & Coke, A, Ordinary	100	248—253	+1	5 8 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—103	..	3 17 8
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	..	3 18 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	121—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	180—185	..	4 1 1
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	158—163	..	4 5 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	247—252	..	3 19 4
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	114—117	..	3 8 5
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—127	..	3 10 10
650,000	,,	,,	6	Do. 6 p. c. do.	100	160—170	..	3 10 7
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	217—222	+6	5 8 1
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5—5⅛	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	114—116	..	4 6 2
541,920	20	28 Nov.	6	Monte Video, Limited	20	18½—19½	..	6 3 1
150,000	5	28 Nov.	10	Oriental, Limited	5	8⅛—9	..	5 11 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5⅞—6⅛	..	5 12 0
166,870	10	26 July	4	Pará Limited	10	3⅝—4⅜	..	8 17 9
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	2 Dec.	6	2nd Do.	100	95—100	..	6 0 0
100,000	10	16 Oct.	10	San Paulo, Limited	10	14⅛—15⅛	..	6 9 2
500,000	Stck.	27 Feb.	13⅜	South Metropolitan, A Stock	100	275—285	..	4 12 11
1,350,000	,,	,,	11⅔	Do. B do.	100	220—230	..	5 0 0
141,500	,,	,,	12	Do. C do.	100	230—240	..	5 0 0
650,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137—142	..	3 10 5
60,000	5	27 Feb.	11⅛	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
						*Ex. div.		
				WATER COMPANIES.				
728,446	Stck.	30 Dec.	9½	Chelsea, Ordinary	100	260—265	..	3 11 8
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	211—213	..	3 9 9
544,140	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	143—148	..	3 0 10
700,000	50	12 Dec.	9	Grand Junction	50	122—126	−½	3 11 5
708,000	Stck.	13 Feb.	10½	Kent	100	271—276	..	3 16 0
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	254—258	..	3 13 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197—202	..	3 14 3
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	124—128	..	3 2 6
500,000	100	13 Feb.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	30 Jan.	4	Do. 4 p. c. Deb. Stk	100	127—130	..	3 1 6
902,300	Stck.	12 Dec.	6	S'thwk & V'xhall, 10 p. c. max.	100	162—166	−2½	3 12 3
126,500	100	,,	6	Do. 7½ p. c. do.	100	160—165	−3	3 12 9
155,066	Stck.	12 Dec.	10	West Middlesex	100	262—265	..	3 15 6

The Water Supply and Sewerage of Buckingham.—At a special meeting of the Buckingham Town Council last Friday, the seal was affixed to a request to the Local Government Board to be allowed to borrow £18,300 on the borough rates, for the proposed new sewage and water works, the plans and specifications for which have been prepared by Mr. Baldwin Latham.

Croydon Town Improvements and the Surplus from the Water-Rates.—The Croydon County Borough Council have determined to carry out certain extensive improvements in the High Street, and some objection has been raised in the Norwood districts, the inhabitants in which fail to perceive what benefit they will reap by these improvements, a proportion of the cost of which would fall upon them. The larger part of Norwood is supplied with water by the Lambeth Water Company, whose charges are higher than those of the Croydon Corporation; and in this the latter have found a means by which they can please the Norwood people. At a recent meeting they passed the following magnanimous resolution:—"That it is desirable to alleviate as far as possible the disadvantage which the Norwood ratepayers suffer by having to pay the Lambeth Company's high charge for water, and the Council is accordingly of opinion that, as far as practicable, the cost of the projected High Street Improvement should be borne out of the surplus of the Croydon water charge."

The Proposed Extension of the Malvern Water-Works.—An inquiry was held at Malvern, last Friday week, by Mr. Arnold Taylor, one of the Inspectors of the Local Government Board, in accordance with a petition by the Local Board, applying for a Provisional Order to empower them to obtain land for the purposes of water supply. The Clerk of the Board (Mr. Lambert) stated that they proposed to take 15¾ acres of common land; being 13¾ acres for a reservoir, and the remaining 2 acres for catchwaters. The site for these works was on an estate near the Board's present pumping-station. The other lands required for collecting purposes were situated in the valleys at different parts along the hill sides. Mr. James Mansergh, C.E., explained the proposed scheme for enlarging the water supply. The Malvern water was of very high repute, being sent to London and Scotland for sale, and it would be collected on the hills in small reservoirs, and carried to large ones for storing; most of the works being underground. The Inspector suggested that the proper thing would be for the Hills Conservators to put before the Board a concise statement of their view of the matter.

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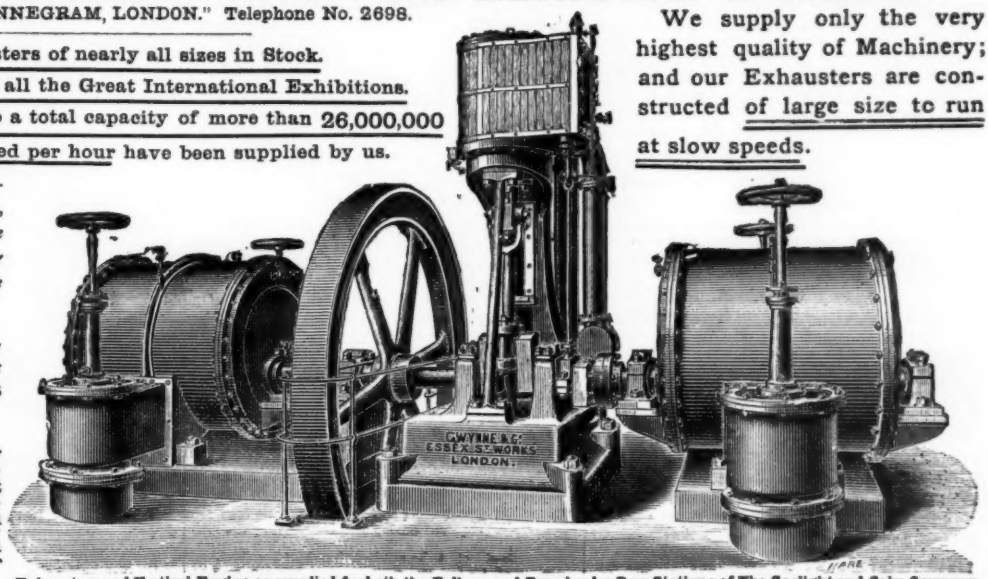

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THE Directors of this Company will be pleased to receive APPLICATIONS from gentlemen willing to undertake the position of SECRETARY and MANAGER of their Works.

Applicants must in every way be qualified and have had charge of Gas-Works where an Engine and Exhauster are used, and furnish not more than four Testimonials, one at least being from a Board of Directors. They must possess a thorough knowledge of Accounts.

Salary to commence at £160 a year. Some allowance will be made for assistance in Office Work.

Security will be required in a bond of not less than £300.

Personal canvassing will not be entertained.

Applications to be sent in on or before the 24th inst., addressed to the Chairman, Gas Company, High Wycombe.

N.B.—It is probable that the gentleman selected may obtain a position with the Water Company of the Town.

FOR SALE—A 7-inch Governor by Braddock. In perfect working order; equal to new; in use Six years. Will be ready in about Six weeks.

For price and particulars, apply to JOHN A HARRIS, Manager, Gas-Works, WIGSTON.

ON SALE—The "Journal of Gas Lighting" for 1884, 5, 6, 7, 8, and 9. Complete, clean, and in good condition. Also for 1881 and 1883 (five Numbers short).

Offers to JOHN JOHNSON, Gas-Works, Halesowen, near BIRMINGHAM.

FOR SALE—Two Small Purifiers. 6ft. 9in. by 3 ft. by 3 ft. 5 in. deep, with Divisions in the middle, and Four-Way Valves. They will require new Lids; but the rest are in good condition.

Particulars may be had by applying to Mr. E H GILBERT, Gas-Works, Earl Shilton, near HINCKLEY.

CAST-IRON TANK AND GASHOLDER FOR SALE.

THE Rugby Gas Company invite Offers for a CAST-IRON TANK, with its GASHOLDER, 62 feet in diameter and 14 feet deep, in good condition, and in use at their old Works.

Apply to Mr. P. SIMPSON, the MANAGER.

Rugby, March 10, 1890.

FOR SALE—One 8-horse power Engine and COAL BREAKER, with top and bottom Elevator, Gear, and Patent Wrought-Iron Chain, with Malleable Iron Buckets complete.

The above Machinery is almost new, having only been in use about Three months.

For further particulars, apply to the COAL DISTILLATION COMPANY—COOPER'S PATENTS—LIMITED, 322 and 323, Winchester House, Old Broad Street, LONDON, E.C.

FOR SALE—Single Gasholder, 60 feet diameter by 23 feet deep. Capacity, 65,000 cubic feet; fixed complete; in good condition.

Also one Single GASHOLDER, 80 feet by 20 feet deep, ten Cast-Iron Columns and Wrought-Iron Girders.

Also four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9in. deep; 12-inch Centre-Valve and Connections.

Would erect the above, and make practically equal to new.

Inquiries invited for various second-hand Gas Plant —Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.

Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

HEYWOOD CORPORATION.

FOR SALE—The whole or portion of the following:—

21 OVAL RETORTS, 18 in. by 13 in. by 8 ft. 6 in. long, and 39 D RETORTS, 16 in. by 18 in. by 8 ft. 6 in. long.

Further particulars upon application to Mr. W. Whatmough, Gas Manager.

Applications to be sent to me, marked "Retorts," not later than Six p.m., on Wednesday, the 19th day of March, 1890.

By order,
ALFRED WALLIS, Town Clerk.

Municipal Buildings, Heywood,
March 3, 1890.

THE Directors of the North Bierley Gas Company have FOR SALE Two PURIFIERS, 18 feet by 11 feet, with Covers, Lifting Gear, 12-inch Connections, and Two 12-inch Four-Way Valves, in good condition.

Offers for the above to be sent in, addressed to the Chairman, on or before Thursday, the 27th day of March, 1890.

The Boxes may be seen, and further information obtained, on application to Mr. W. Oldfield, Manager.

By order,
EPHRAIM SUCKSMITH, Secretary.

Gas-Works, Oakenshaw, near Bradford,
March 14, 1890.

NORTH BIERLEY GAS COMPANY.

THE Directors of the above Company invite TENDERS for the purchase of all the AMMONIACAL LIQUOR of 5° Twaddel, and also the surplus TAR produced at their Works for One year, from the 1st day of April, 1890.

Tenders are to be sent in, addressed to the Chairman, on or before Thursday, the 27th day of March, 1890, endorsed on the outside "Tender for Ammoniacal Liquor" or "Tar."

Further information may be obtained on application to Mr. W. Oldfield, Manager.

The Directors do not bind themselves to accept the highest or any tender.

By order,
EPHRAIM SUCKSMITH, Secretary.

Gas-Works, Oakenshaw, near Bradford,
March 14, 1890.

TOTTENHAM & EDMONTON GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £10,000 NEW STOCK, 1882.

IN pursuance of the Tottenham and Edmonton Gas Act, 1882, Notice is hereby given that it is the intention of the Directors of the Company to SELL BY TENDER £10,000 of NEW STOCK of the Company, to be paid up in full on or before the 1st day of May next; such STOCK being a portion of additional Capital, authorized to be raised by resolutions passed at an Extraordinary Meeting of the Proprietors, held on the 22nd day of February, 1890, under the powers of the above-mentioned Act.

Particulars and conditions of tender may be obtained on application to this Office; and sealed tenders must be sent in not later than Four o'clock in the Afternoon, on Monday, the 31st day of March next.

By order of the Board,
JAMES RANDALL, Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Feb. 28, 1890.

SPENT OXIDE.

THE Woolton Gas Company are prepared to receive OFFERS for about 70 tons of SPENT OXIDE.

Samples and particulars may be had on application to the undersigned.

Tenders to be addressed to the Chairman of the Gas Company, Woolton, near Liverpool, on or before March 21.

HENRY HATCH, Manager.

March 1, 1890.

COLNE AND MARSDEN LOCAL BOARD.

THE Gas and Lighting Committee of the above Board invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR, to be produced at the Gas-Works, for One year, as and from the 25th of March, 1890.

Particulars may be obtained from the Manager.

Endorsed tenders must be sent to me on or before Saturday, the 22nd of March inst.

ALFRED VARLEY, Clerk to the Board.

Colne Lane, Colne, March 8, 1890.

PURIFYING PLANT.

THE Lymm Local Board invite Tenders for the Construction and Erection of PURIFYING PLANT, consisting of four 10-feet square Purifiers, Centre-Valve, Lifting Gear, and the necessary 9-inch Connections.

Full particulars and specifications can be had on application to Mr. A. Graham, Gas Manager.

Tenders to be sent to the undersigned, endorsed "Purifiers," on or before March 29, 1890.

The Board reserve the right of accepting the lowest or any tender.

N. MULLARD,
Clerk to the Board.

Lymm, March 14, 1890.

ULVERSTON LOCAL BOARD.
(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the supply of B.O.V. (made from Spent Oxide) required during the Year ending the 25th of March, 1891.

Strength of Acid to be not less than 144° Twaddel.

Forms of tender and conditions of contract may be had on application to the undersigned.

Tenders, endorsed "B.O.V.," to be sent in not later than the 27th inst., addressed to the Chairman of the Gas and Water Committee.

JNO. SWAN,
Engineer and Manager.

TO PIPE FOUNDERS.

THE Directors of the Monmouth Gas and Water Company, Limited, are prepared to receive TENDERS for the supply of 4600 yards of 5-inch Spigot and Socket WATER-MAINS. Each 9 feet length to weigh 2 cwt., and to be coated with Dr. Angus Smith's Composition, and tested to 500 feet head.

Tenders to state price per ton, delivered at Monmouth Station.

Terms: Net cash on delivery.

The Directors do not bind themselves to accept the lowest or any tender.

THOMAS BRACE,
Secretary and Manager.

Gas and Water Office, Monmouth.

THE Directors of the Camborne Gas Company, Limited, are prepared to receive TENDERS for TELESCOPING their 45 feet GASHOLDER, as per plans and specifications prepared by the Company's Engineer.

The plans and specifications are deposited at the Offices of Messrs. Pearce, Sharpe, and Co., Metal Agents, 59, Cornhill, E.C., where they may be inspected on any date up to the 22nd inst., between the hours of Eleven and Four.

Tenders will be received by the Secretary of the Company, Camborne, Cornwall, up to Wednesday, the 26th inst.

The lowest or any tender not necessarily accepted.

TO CONTRACTORS AND BUILDERS.

THE Directors of the Romford Gas and Coke Company, Limited, are prepared to receive TENDERS for a BRICK and CONCRETE GASHOLDER TANK, 81 ft. 6 in. diameter by 24 ft. 3 in. deep, to be constructed at their new Works.

Drawings and specifications may be seen, and all particulars obtained, upon application to the Engineer at the Gas Company's Office.

Tenders must be sealed, and endorsed "Tender for Gasholder Tank," and delivered, addressed to the Chairman of the Gas Company, not later than Friday, the 28th inst.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
W. D. CHILD,
Engineer and Manager.

Gas Company's Office, South Street,
Romford, March 15, 1890.

TO BUILDERS, BRICKLAYERS, AND OTHERS.

THE Chard Gas Company are prepared to receive TENDERS for the Excavations for, and the Erection of a BRICK TANK, 51 ft. 6 in. diameter inside by 14 feet deep.

Drawing and specification may be seen at the Gas-Works, Chard, Somerset.

Tenders to be delivered on or before March 31, endorsed "Tender for Tank," and addressed to Mr. WILLEY, Gas Engineer, EXETER.

TENDERS FOR TAR AND LIQUOR.

THE Rugby Gas Company are prepared to receive TENDERS for the surplus TAR and LIQUOR made at their Works, for either One, Two, or Three years, commencing the 31st of March.

Tenders to be sent in, under cover, to the undersigned, on or before Thursday, the 3rd of April.

The Directors do not bind themselves to accept the highest or any tender.

Particulars may be had from
P. SIMPSON, Manager.

Rugby, March 5, 1890.

BOROUGH OF DARWEN.

TO TAR DISTILLERS, ETC.

THE Gas Committee are prepared to receive OFFERS for the purchase of all the surplus GAS TAR to be produced at their Works, for One, Two, or Three years, commencing April 1.

Coals carbonized: About 12,000 tons per annum.

Tar will be delivered into Contractor's Railway Tank-Wagons at the Corporation Private Siding.

Conditions and forms of tender, together with any further particulars may be obtained from Mr. T. Duxbury, Manager, Gas-Works, Darwen.

Sealed tenders to be delivered to me, marked "Tender for Tar," at or before Noon of the 24th day of March, 1890.

By order,
CHAS. COSTEKER, Town Clerk.

BOROUGH OF BURTON-UPON-TRENT.

TO COLLIERY PROPRIETORS.

THE Gas Committee of the Corporation of the Borough of Burton-upon-Trent are prepared to receive TENDERS, from Colliery Proprietors only, for the supply of from 1000 to 20,000 tons (21 cwt. to the ton) of Best Screened GAS COAL; to be delivered in Sender's or Railway Company's Trucks at the Gas-Works' Railway Siding, Burton-upon-Trent, between the 1st day of April next and the 31st day of March, 1891.

The deliveries are to be made in such quantities and at such times as may be directed by the Manager.

Payments: Net cash, monthly.

Tenders, enclosed in an envelope, sealed and endorsed "Tender for Coal," are to delivered to me at or before Ten a.m. on Thursday, the 27th of March inst.

The Committee reserve to themselves the right of rejecting the lowest or any tender.

F. L. RAMSDEN,
Manager and Engineer.

Gas-Works, Burton-upon-Trent,
March 5, 1890.

COMMERCIAL GAS COMPANY.

NOTICE is hereby given that an OrdiNARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 3rd of April, 1890, at Twelve o'clock at Noon—

To receive the Report of the Directors;
To declare a Dividend;
To elect Directors and an Auditor in the place of those retiring;
And for other Business.

The Stock Transfer Books will be closed from the 21st of March inst. to the 3rd of April, both days inclusive.

By order of the Board,
H. D. ELLIS, Secretary.

Offices, Stepney, March 12, 1890.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 26th inst., at half-past Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31st of December last.

NOTICE IS HEREBY ALSO GIVEN that the Transfer Books of the Company will be closed on the 15th and re-opened on the 27th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 7, 1890.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

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The Manchester Oxygen (BRIN'S PATENT) Co., Ltd.,

GREAT MARLBOROUGH ST., OXFORD ROAD,

MANCHESTER.

Manufacturers and Compressors of all kinds of Gas.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

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NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES AND MANUFACTURERS OF

IMPROVED GASHOLDERS AND BOILERS

and Manufacturers of every description of

Gas Apparatus

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

— REGENERATIVE SETTINGS OF RETORTS. —

Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

STREET-LAMPS,

ORDINARY OR

OUR SPECIAL HIGH-POWER.

The best Lamps in the Trade.

Street-Lamp Governors. Gas-Meters.

HULETT'S

SERVICE CLEANSER.

No Gas Company should be without this Apparatus.

THOUSANDS IN USE.

Every Description of Gas-Fittings, Pressure-Gauges, &c.

D. HULETT & CO., LIMITED,

55 & 56, HIGH HOLBORN, LONDON.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected, including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

WEST'S GAS IMPROVEMENT CO., LIMITED,

Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER 160 MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

ADVANTAGES ATTENDING ITS USE ARE:—

INCREASED VOLUME of GAS per TON and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from 8 PENCE to 15 PENCE per Ton of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by Wire Rope, Steam, or Compressed Air.—The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

Sole Makers of **CIRCULAR, OVAL,** or Ω-shaped **MOUTHPIECES,** with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

which, by a simple wedging action at each end of the crossbar, secure a very tight joint; and as the same time, by their long sliding motion, they effectually remove the tar or other matter from the surfaces of the mouthpiece and lid.

N.B.—The whole of these Fittings are made of Wrought Iron.

Estimates and further particulars forwarded upon application for Mouthpieces complete, or for Lids and Fastenings separately.

MAKERS OF THOMAS AND SOMERVILLE'S COKE-BREAKING MACHINE.

SOLE MAKERS OF WHITE'S PATENT AUTOMATIC GAS-VALVE.

Mr. JOHN WEST, M. Inst. C.E., Managing Director.

ILLUSTRATED CATALOGUE SENT UPON APPLICATION.

JAMES D. PERKINS. F. SEAVERNS.

PERKINS & Co.,

228 & 229, PRODUCE EXCHANGE, NEW YORK.

Cable Address: "PERKINS, NEW YORK." *Post Office Box 3695, New York.*

SOLE AGENTS FOR THE CELEBRATED

BRECKENRIDGE CANNEL

AND THE

OLD KENTUCKY BOGHEAD

OF KENTUCKY, U.S.A.

These Cannels will rank with the Australian Shale for Gas Manufacture.

Also General Sales Agents for

PENNSYLVANIA GAS COALS AND AMERICAN FOUNDRY & FURNACE COKE.

Delivery Prices made to any Port in

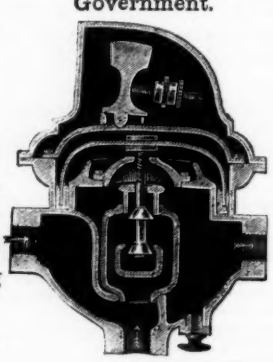
GREAT BRITAIN, ON THE CONTINENT, OR SOUTH AMERICA.

Full Information furnished upon Application to the above Address.

THE WENHAM AUTOMATIC GAS GOVERNOR

As supplied to and approved of by H.M. Government.

The most reliable Automatic Method of economizing Gas without reducing the Illuminating Power.



HUNDREDS ALREADY FIXED.

FLOOR WARMING STOVES

(LEEDS' PATENT).

CAN BE SUPPLIED FOR EITHER GAS OR OIL.

THESE STOVES ARE *CLEANLY, PORTABLE ECONOMICAL,*

And applicable for all kinds of Rooms where a Comfortable and Wholesome Atmosphere is desired.

For Prices and further Particulars, apply to the Manufacturers,

THE WENHAM COMPANY, LTD.,

UPPER OGLE STREET, FITZROY SQUARE, LONDON, W.

MANCHESTER: 5, Deansgate. BIRMINGHAM: 121, Corporation Street.

REVOLUTION
IN GASHOLDER CONSTRUCTION.
(GADD & MASON'S PATENTS.)

IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.
IMMENSE SAVING IN COST.

NO COLUMNS. NO FRAMING
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NO PIERS ROUND TANK.
NO PIERS ROUND TANK.
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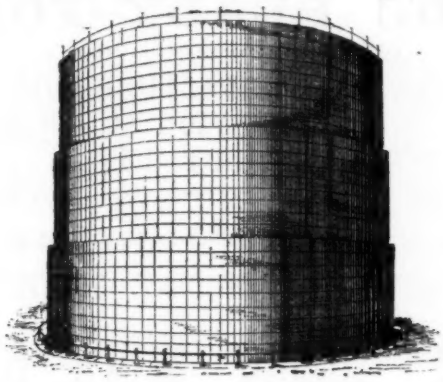

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IMMENSE SAVING IN COST.
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NO COLUMNS. NO FRAMING.
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NO COLUMNS. NO FRAMING.

NO PIERS ROUND TANK.
NO PIERS ROUND TANK.
NO PIERS ROUND TANK.

GREATER STABILITY. TILTING IMPOSSIBLE.

Tank Construction rendered far simpler and very much cheaper; the Piers and heavy Base Stones being dispensed with.

In Holders for Export a very large additional saving is effected in Carriage, Freight, Transport, and Insurance; the weight being reduced nearly **50 per cent.**

Admitted by eminent Engineers to be the system of the future.

Our Alternative Arrangements of Torsional and Tensional Gearing **WE DO NOT RECOMMEND.** The former, by means of Geared Shafting, or Rack and Pinion, **IS CLUMSY**; whilst the latter, by means of Chains or Ropes, **IS UNRELIABLE AND DANGEROUS.**

Engineers intending to extend their Gas Storeage should not fail to see the TWO-LIFT HOLDER erected for the Northwich Gas Company.

PLANS, SPECIFICATIONS, AND ESTIMATES SUPPLIED.

Telegrams: "SPIRAL MANCHESTER."

The PATENT GASHOLDER SYNDICATE,
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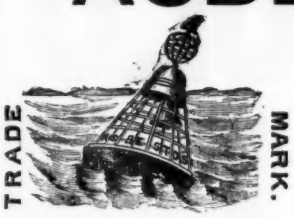
BELL'S ASBESTOS AQUOL PAINT



BELL'S ASBESTOS

IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN, BARCELONA, and ANTWERP.

BELL'S ASBESTOS

EXPANSION SHEETING.

The above, which can only be obtained from this house, is recognized as the **most efficient and economical jointing material in use.** It is composed of a specially-prepared India-rubber Compound, protected by a covering of Vulcanized Asbestos Sheeting, as shown above; and as it is the only Jointing Material which adequately **combines permanent elasticity with heat resistance,** the advantage it possesses will at once be seen.

EXPANSION RINGS.

The centre from which the requisite elasticity is obtained will adapt itself to uneven surfaces to which it may be applied, and allow the expansion and contraction to be fully taken up. The covering being of Asbestos Cloth imparts a protection to the centre, and so prolongs its elasticity. **For Manhole, Mudhole, Steam Pipe, and Mash Tun Door Joints, it is unequalled;** and if applied as directed, **a ring can be used many times over.**

Made from 1-Ply for Cylinder and Faced Joints to any thickness for Uneven Surfaces.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

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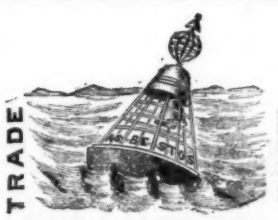
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
DUBLIN, BERLIN.



BELL'S ASBESTOS.

DEPÔTS.

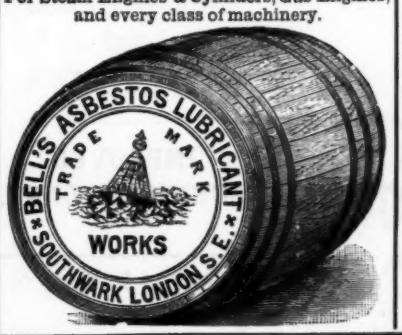
BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
CARDIFF: West Bute Street.
BARCELONA, and ANTWERP.

Southwark, London, S.E.

BELLS ASBESTOS
YARN AND SOAPSTONE PACKING
Is the BEST LOCOMOTIVE PACKING made.

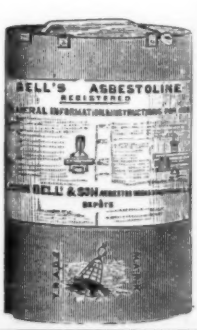
BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

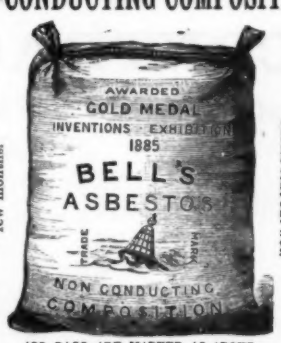


ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.
Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
"DAGGER" PACKING
Is unequalled for every kind of Marine and Land Engine, Steam-Pumps, &c., and has proved itself to be the most efficient durable, and economical Packing made.

BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.

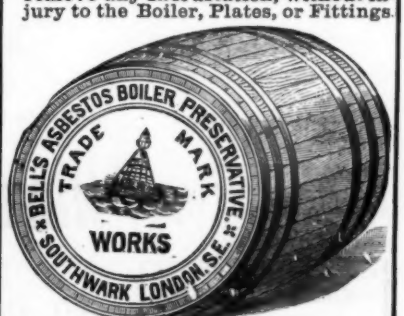
Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



Can be applied again after many years' service.
Is sent out dry in bags: therefore cheaper than others sent out wet.

ALL BAGS ARE MARKED AS ABOVE.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

LONDON OFFICE, 60, QUEEN VICTORIA St. E.C.

CLAYTON SON & Co
LIMITED,
LEEDS.
MAKE
RETORT LIDS
OF ALL FORMS & SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC
MACHINERY.

PRICES ON APPLICATION.

JOHN ABBOT & CO., LIMITED.
ESTABLISHED 100 YEARS.
THE LARGEST
SULPHATE PLANT MANUFACTURERS
IN THE TRADE.

The present Low Prices render it absolutely necessary for Gas Engineers to use the commonest Pyrites Acid, and obtain the whitest and best quality of Sulphate, so as to obtain a better price and more ready market.

For this purpose they strongly recommend the

NEW IMPROVEMENTS

Combined with their

PATENT SAFETY CLOSED SATURATORS
AND
Improved Self-acting Steam Liming Process
Under pressure, effecting a considerable Saving in Time in Working off the Contents of each Still.

— OVER —
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IN OPERATION.

A number of Plants on the Open System recently remodelled with greatly improved results.

GAS AND WATER PIPES, HYDRAULIC CRANES, CAPSTANS, BOILERS, ROOFS, TANKS, &c.

Messrs. ABBOT & Co. (Works at Gateshead-on-Tyne) employ 2000 men, including several experienced Plumbers, to erect New and remodel Old Sulphate Plants.

Applications to be made to the

LONDON OFFICE,
SUFFOLK HOUSE, CANNON STREET, E.C

GAS COAL.
BEST
REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.

W. C. HOLMES & CO.,
CONTRACTING GAS ENGINEERS.

SPECIALITIES.

Patent Regenerative Retort-Settings.

Patent Rotary Scrubber-Washer.

Patent Reciprocating Exhauster.

Patent Regulator.

Patent Anti-Dip Pipes.

Telegrams:
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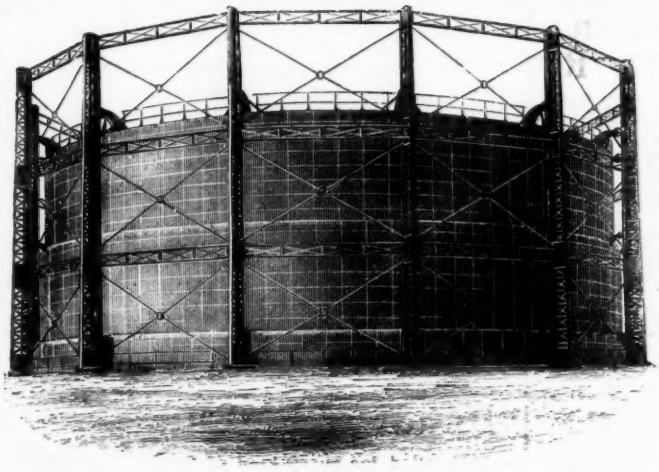

Treble-Lift Gasholder, 130 ft. by 66 ft., as erected at Burton-on-Trent, 1889.

WHITESTONE IRON-WORKS,
HUDDERSFIELD,
AND
80, CANNON STREET, LONDON, E.C.

SOLE MAKERS OF
DRAKE'S
PATENT
GAS PLANT
Specially adapted for Country Places, and for mixing with Coal Gas to increase Illuminating Power.

Condensers, Scrubbers, Purifiers, and all Fittings for Gas-Works.

IMPROVED
CHEMICAL PLANT.

Illustrated Catalogues on application.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:
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WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET,
LEEDS

LONDON OFFICE:
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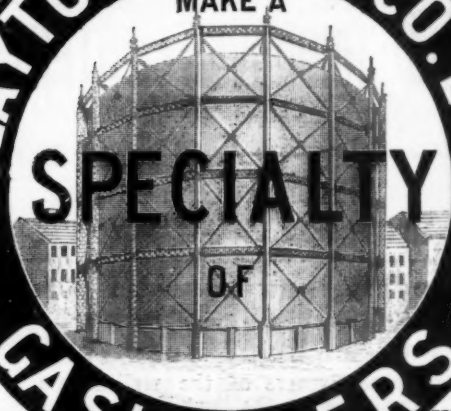
CLAYTON SON & CO. LTD.

MAKE A



SPECIALTY
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GASHOLDERS

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OF

REG^D TELEGRAPHIC ADDRESS:
"GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

JOHN BROWN & CO., LIMITED,
ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

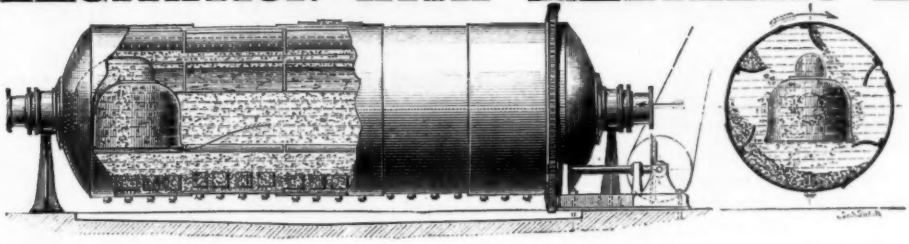
THE

REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY.
REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

GOLD MEDAL, INVENTIONS EXHIBITION, 1885.

Revolving Purifier Company, Limited,

DOCK HOUSE, BILLITER STREET, LONDON, E.C.

— SPECIAL NOTICE. —

G. J. PARKINSON & Co.,

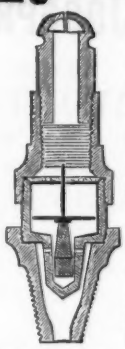
PENN STREET, CURZON STREET, BIRMINGHAM,

Have, from the 1st of January, 1890, commenced the supply of their

IMPROVED PATENT GAS GOVERNOR BURNER,

which cannot be surpassed by any other Burner in the market at the present time.

DO NOT MELT.



Please mention when required for Cannel Gas.

PRICE 14s. PER DOZEN. *Trade Terms and further particulars on application.*

They will be pleased to supply a sample of their IMPROVED PATENT STREET LAMP GOVERNOR, *free of charge*, to Gas Companies, Corporations, and Municipal Authorities on application.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE STREET, BIRMINGHAM—AGENT: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

FIRE BRICKS,

LUMPS, TILES,

BLOCKS, &c.

Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR GAS-WORKS.

MOBBERLEY & PERRY,

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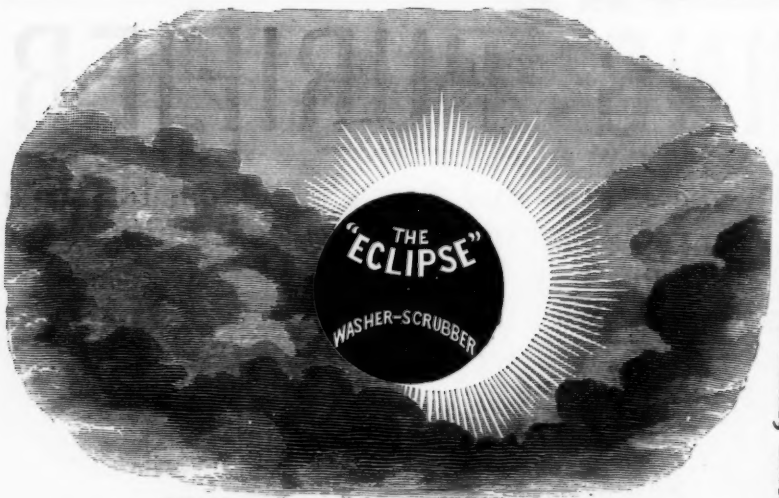

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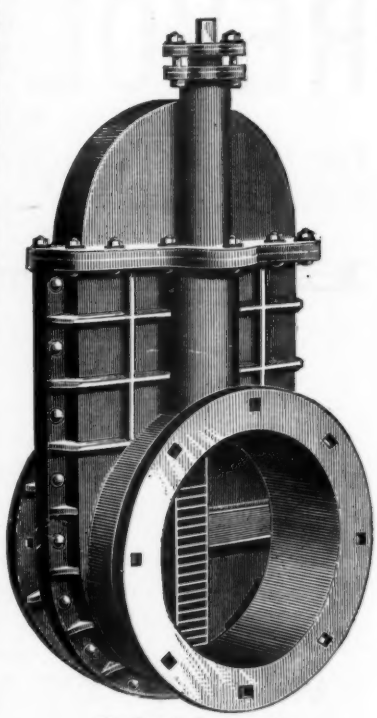

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London: Printed by WALTER KING (at the Office of King, Selb, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, March 18, 1890.